Scientific and Technical Aerospace Reports

Volume 39
March 23, 2001

National Aeronautics and Space Administration
Langley Research Center

Scientific and Technical Information Program Office

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Scientific and Technical Aerospace Reports (STAR) is an electronic abstract journal, listing citations with abstracts for aerospace-related reports obtained from worldwide sources. It is electronically published biweekly and announces documents that have recently been entered into the NASA Scientific and Technical Information (STI) Database. The documents are of the following types:

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- Domestic and foreign dissertations and theses.

Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

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Subject Divisions

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F. Life Sciences
G. Mathematical and Computer Sciences
H. Physics
I. Social and Information Sciences
J. Space Sciences
K. General

Indexes

Two indexes are available. You may use the find command under the tools menu while viewing the PDF file for direct match searching on any text string. You may also select either of the two indexes provided for searching on *NASA Thesaurus* subject terms and personal author names.

Subject Term Index
Personal Author Index

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01 Aeronautics (General) 1

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see *categories 02 through 09*. For information related to space vehicles see *12 Astronautics*.

02 Aerodynamics 2

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also *34 Fluid Mechanics and Heat Transfer.*

03 Air Transportation and Safety 5

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety*; and *85 Technology Utilization and Surface Transportation*.

04 Aircraft Communications and Navigation 12

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation*; *17 Space Communications; Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar.*

05 Aircraft Design, Testing and Performance 15

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Technology Utilization and Surface Transportation*.

06 Avionics and Aircraft Instrumentation 18

Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For relatead information see also *04 Aircraft Communications and Navigation; 08 Aircraft Stability and Control; 19 Spacecraft Instrumentation and Astrionics; and 35 Instrumentation and Photography.*

07 Aircraft Propulsion and Power 19

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

08 Aircraft Stability and Control 20

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

09 Research and Support Facilities (Air) 21

Includes airports, runways, hangers, and aircraft repair and overhaul facilities, wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operation see *03 Air Transportation and Safety.* For astronautical facilities see *14 Ground Support Systems and Facilities (Space).*

Subject Categories of the Division B. Astronautics

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12 Astronautics (General) 25

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see *categories 13 through 20*. For extraterrestrial exploration, see *91 Lunar and Planetary Science and Exploration*.

13 Astrodynamics 27

Includes powered and free-flight trajectories; and orbital and launching dynamics.

15 Launch Vehicles and Launch Operations 28

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also *18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.*

16 Space Transportation and Safety 28

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also *03 Air Transportation and Safety* and *15 Launch Vehicles and Launch Vehicles,* and *18 Spacecraft Design, Testing and Performance*. For space suits, see *54 Man/System Technology and Life Support*.

18 Spacecraft Design, Testing and Performance 33

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see *54 Man/System Technology and Life Support*. For related information, see also *05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.*

19 Spacecraft Instrumentation and Astrionics 37

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also *06 Aircraft Instrumentation and Avionics;* For spaceborne instruments not integral to the vehicle itself see *35 Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy, Instrumentation and Photography*; For spaceborne telescopes and other astronomical instruments see *89 Astronomy.*

20 Spacecraft Propulsion and Power 37

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also *07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations;* and *44 Energy Production and Conversion.*

Subject Categories of the Division C. Chemistry and Materials

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23 Chemistry and Materials (General) 49

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 24 through 29*. For astrochemistry see category *90 Astrophysics*.

24 Composite Materials 50

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

25 Inorganic, Organic, and Physical Chemistry 58

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also *34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics*.

26 Metals and Metallic Materials 66

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

27 Nonmetallic Materials 72

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials.*

28 Propellants and Fuels 81

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion*.

29 Space Processing 86

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced–gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy.*

Subject Categories of the Division D. Engineering

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

31 Engineering (General) 89

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.

32 Communications and Radar 93

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also *04 Aircraft Communications and Navigation;* and *17 Space Communications, Spacecraft Communications, Command and Tracking;* for search and rescue see *03 Air Transportation and Safety,* and *16 Space Transportation and Safety.*

33 Electronics and Electrical Engineering 107

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also *60 Computer Operations and Hardware;* and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar.*

34 Fluid Mechanics and Thermodynamics 116

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics.*

35 Instrumentation and Photography 130

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation;* and *19 Spacecraft Instrumentation*.

36 Lasers and Masers 138

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also *76 Solid-State Physics*.

37 Mechanical Engineering 140

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

38 Quality Assurance and Reliability 142

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

39 Structural Mechanics 143

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

Subject Categories of the Division E. Geosciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

42 Geosciences (General) 146

Includes general research topics related to the Earth sciences, and the specific areas of petrology, minerology, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

43 Earth Resources and Remote Sensing 152

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see *35 Instrumentation and Photography.*

44 Energy Production and Conversion 156

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power,* and *28 Propellants and Fuels*.

45 Environment Pollution 164

Includes atmospheric, water, soil, noise, and thermal pollution.

46 Geophysics 183

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology;* and *93 Space Radiation*.

47 Meteorology and Climatology 191

Includes weather observation forecasting and modification.

48 Oceanography 198

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

Subject Categories of the Division F. Life Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

51 Life Sciences (General) 202

Includes general research topics related to plant and animal biology (non–human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.

52 Aerospace Medicine 254

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

53 Behavioral Sciences 282

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 Man/System Technology and Life Support 286

Includes human factors engineering; bionics, man–machine, life support, space suits and protective clothing. For related information see also *16 Space Transportation* and *52 Aerospace Medicine*..

55 Exobiology 292

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Science*.

Subject Categories of the Division G. Mathematical and Computer Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

59 Mathematical and Computer Sciences (General) 293

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

60 Computer Operations and Hardware 294

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

61 Computer Programming and Software 295

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

62 Computer Systems 305

Includes computer networks and distributed processing systems. For information systems see *82 Documentation and Information Science*. For computer systems applied to specific applications, see the associated category.

63 Cybernetics, Artificial Intelligence and Robotics 307

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support.*

64 Numerical Analysis 312

Includes iteration, differential and difference equations, and numerical approximation.

65 Statistics and Probability 313

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

67 Theoretical Mathematics 314

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

Subject Categories of the Division H. Physics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

70 Physics (General) 315

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see *categories 71 through 77*. For related instrumentation see *35 Instrumentation and Photography;* for geophysics, astrophysics or solar physics see *46 Geophysics, 90 Astrophysics,* or *92 Solar Physics*.

71 Acoustics 317

Includes sound generation, transmission, and attenuation. For noise pollution see *45 Environment Pollution.* For aircraft noise see also *02 Aerodynamics* and *07 Aircraft Propulsion Propulsion and Power.*

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Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see *73 Nuclear Physics*.

73 Nuclear Physics 325

Includes nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*. For atomic and molecular physics see *72 Atomic and Molecular Physics*. For elementary particle physics see *77 Physics of Elementary Particles and Fields*. For nuclear astrophysics see *90 Astrophysics*.

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77 Physics of Elementary Particles and Fields 352

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also *72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.*

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82 Documentation and Information Science 364

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software*.

84 Law, Political Science and Space Policy 370

Includes aviation law; space law and policy; international law; international cooperation; and patent policy.

Subject Categories of the Division J. Space Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

88 Space Sciences (General) 371

Includes general research topics related to the natural space sciences. For specific topics in space sciences see *categories 89 through 93*.

89 Astronomy 371

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x–ray, ultraviolet, and infrared astronomy; and astrometry.

90 Astrophysics 376

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

91 Lunar and Planetary Science and Exploration 381

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.

92 Solar Physics 398

Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation.*

93 Space Radiation **400**

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *52 Aerospace Medicine*. For theory see *73 Nuclear Physics*.

Subject Categories of the Division K. General

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99 General **402**

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

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Typical Report Citation and Abstract

❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
❹ Mar. 1996; 130p; In English
❺ Contract(s)/Grant(s): RTOP 505-68-70-04
❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10’ to 50’, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65’ swept forebody serrations tended to roll together, while vortices from 40’ swept serrations were more effective in generating additional lift caused by their more independent nature.
❽ Author
❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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VOLUME 39, MARCH 23, 2001

01
AERONAUTICS (GENERAL)

Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20010020652 NASA Langley Research Center, Hampton, VA USA
Research Opportunities in Advanced Aerospace Concepts
Jones, Gregory S., NASA Langley Research Center, USA; Bangert, Linda S., NASA Langley Research Center, USA; Garber, Donald P., NASA Langley Research Center, USA; Huebner, Lawrence D., NASA Langley Research Center, USA; McKinley, Robert E., NASA Langley Research Center, USA; Sutton, Kenneth, NASA Langley Research Center, USA; Swanson, Roy C., Jr., NASA Langley Research Center, USA; Weinstein, Leonard, NASA Langley Research Center, USA; December 2000; 68p; In English
Contract(s)/Grant(s): RTOP 522-17-41-30
Report No.(s): NASA/TM-2000-210547; L-18030; NAS 1.15:210547; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report is a review of a team effort that focuses on advanced aerospace concepts of the 21st Century. The paper emphasis advanced technologies, rather than cataloging every unusual aircraft that has ever been attempted. to dispel the myth that ”aerodynamics is a mature science” an extensive list of ”What we cannot do, or do not know” was enumerated. A zeit geist, a feeling for the spirit of the times, was developed, based on existing research goals. Technological drivers and the constraints that might influence these technological developments in a future society were also examined. The present status of aeronautics, space exploration, and non-aerospace applications, both military and commercial, including enabling technologies are discussed. A discussion of non-technological issues affecting advanced concepts research is presented. The benefit of using the study of advanced vehicles as a tool to uncover new directions for technology development is often necessary. An appendix is provided containing examples of advanced vehicle configurations currently of interest.
Author
Aerospace Engineering; Multidisciplinary Research; Aircraft Design; Aerodynamics

20010021288 National Defense Univ., Inst. for National Strategic Studies, Washington, DC USA
DOD C-17 versus the Boeing 777: A Comparison of Acquisition and Development
Battershell, A. Lee, National Defense Univ., USA; October 1999; 120p; In English
Report No.(s): PB2000-103114; LC-98-44146; ISBN 1-57906-017-X; No Copyright; Avail: National Technical Information Service (NTIS)

In 1995, two significant aircraft made aviation history as they lifted off runways in different parts of the country. One, the Boeing 777, a wide-bodied, two-engine passenger plane created by private enterprise, made its first commercial transoceanic flight in June 1995. The other, the C-17, a military cargo plane created by the Department of Defense (DOD), received initial operating certification in January 1995. Each aircraft exhibited innovative design and high-tech features, but neither boasted an unprecedented level of untried technology. They were similar in many ways-both intended to ferry passengers or cargo with appropriate ease from one point to another. Yet each of these aircraft had a unique story of development-one a straightforward narrative of almost 9 years, the other a complex, convoluted yarn spanning 24 years. Even after Congress approved funding, the C-17 time table was greater than the Boeing 777. This study compares and contrasts the histories of these two aircraft to determine why a

private-sector company was able to develop and produce the 777 in significantly less time than the government took to develop and produce the C-17.
NTIS
Defense Program; C-17 Aircraft; Boeing 747 Aircraft; Research and Development

20010021519 National Renewable Energy Lab., Golden, CO USA
Evolution of Rotor and Blade Design
Tangler, J.; Aug. 01, 2000; 11p; In English
Report No.(s): DE00-763404; NREL/CP-500-28410; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this paper is to provide a historical perspective of the evolution of rotor and blade design during the last 20 years. This evolution is a balanced integration of economic, aerodynamic, structural dynamic, noise, and aesthetic considerations, which are known to be machine type and size dependent.
NTIS
Histories; Rotors; Turbine Blades; Design Analysis; Rotor Blades (Turbomachinery)

20010021736 NASA Ames Research Center, Moffett Field, CA USA
Integrated Airplane Health Management System
Bardina, Jorge, NASA Ames Research Center, USA; McDermott, William J., NASA Ames Research Center, USA; Follen, Gregory J., NASA Glenn Research Center, USA; Blaser, Tammy M., NASA Glenn Research Center, USA; Pavlik, William R., NASA Glenn Research Center, USA; Zhang, Desheng, NASA Glenn Research Center, USA; Liu, Xian-You, NASA Glenn Research Center, USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 185-196; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The National Air Space System-Wide Simulation (NAS Sim) program advances the development and implementation of a comprehensive, integrated health management system contributing to safety and modeling of the national aviation system. This program integrates different disciplines to develop an accurate and insightful method for real-time modeling of the local integrated airplane risk exposure and monitoring of operations of the global national air space.
Author
Airspace; Health; Management Systems; Safety Factors; Systems Engineering; National Aviation System

02
AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also 34 Fluid Mechanics and Heat Transfer.

20010020302 Princeton Univ., Dept. of Material and Aerospace Engineering, NJ USA
Aerodynamic Shape Optimization Techniques Based on Control Theory ***Final Report, 1 Apr. 1995 - 30 Jun. 1998***
Jameson, Antony; Martinelli, Luigi; Jul. 25, 2000; 33p; In English
Contract(s)/Grant(s): F49620-95-1-0259; AF Proj. 2304
Report No.(s): AD-A385586; AFRL-SR-BL-TR-00-0677; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document serves as a final technical report for the AFOSR award F49620-95-1-0259. It reviews the formulation and application of optimization techniques based on control theory for aerodynamic shape design in viscous compressible flow. The theory is applied to a system defined by the partial differential equations of the flow, with the boundary shape acting as the control. The Frechet derivative of the cost function is determined via the solution of an adjoint partial differential equation, and the boundary shape is then modified in a direction of descent. This process is repeated until an optimum solution is approached. Each design cycle requires the numerical solution of both the flow and the adjoint equations, leading to a computational cost roughly equal to the cost of two flow solutions. Representative results are presented for viscous optimization of transonic wing-body combinations.
DTIC
Aerodynamic Configurations; Shape Optimization; Body-Wing Configurations; Control Theory; Computational Fluid Dynamics; Navier-Stokes Equation; Viscous Flow; Compressible Flow; Flow Equations

20010020501 Honeybee Robotics Ltd., New York, NY USA

Mars Balloon Based Touch and Go Surface Sampler (TAGSS)

Rafeek, S., Honeybee Robotics Ltd., USA; Stroescu, S., Honeybee Robotics Ltd., USA; Kong, K. Y., Honeybee Robotics Ltd., USA; Sadick, S., Honeybee Robotics Ltd., USA; Bartlett, P. W., Honeybee Robotics Ltd., USA; Davis, K. R., Honeybee Robotics Ltd., USA; Ummy, M. A., Honeybee Robotics Ltd., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 257-258; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Touch and Go Surface Sampler (TAGSS) is a new class of planetary body sample acquisition tool that can be used for Mars surface sampling. TAGSS in its basic configuration consists of a high speed sampling head attached to the end of a flexible shaft. The sampling head consists of counter rotating cutters that rotates at speeds of 3000 to 15000 RPM. The attractive feature of this 'touch and go' type sampler is that there are no requirements for a lander.

Author

Mars Surface Samples; Mars Missions; Spacecraft Instruments; Samplers

20010020515 NASA Ames Research Center, Moffett Field, CA USA

TMBM: Tethered Micro-Balloons on Mars

Sims, M. H., NASA Ames Research Center, USA; Greeley, R., Arizona State Univ., USA; Cutts, J. A., Jet Propulsion Lab., California Inst. of Tech., USA; Yavrouian, A. H., Jet Propulsion Lab., California Inst. of Tech., USA; Murbach, M., NASA Ames Research Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 285; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The use of balloons/aerobots on Mars has been under consideration for many years. Concepts include deployment during entry into the atmosphere from a carrier spacecraft, deployment from a lander, use of super-pressurized systems for long duration flights, 'hot-air' systems, etc. Principal advantages include the ability to obtain high-resolution data of the surface because balloons provide a low-altitude platform which moves relatively slowly. Work conducted within the last few years has removed many of the technical difficulties encountered in deployment and operation of balloons/aerobots on Mars. The concept proposed here (a tethered balloon released from a lander) uses a relatively simple approach which would enable aspects of Martian balloons to be tested while providing useful and potentially unique science results. Tethered Micro-Balloons on Mars (TMBM) would be carried to Mars on board a future lander as a stand-alone experiment having a total mass of one to two kilograms. It would consist of a helium balloon of up to 50 cubic meters that is inflated after landing and initially tethered to the lander. Its primary instrumentation would be a camera that would be carried to an altitude of up to tens of meters above the surface. Imaging data would be transmitted to the lander for inclusion in the mission data stream. The tether would be released in stages allowing different resolutions and coverage. In addition during this staged release a lander camera system may observe the motion of the balloon at various heights above he lander. Under some scenarios upon completion of the primary phase of TMBM operations, the tether would be cut, allowing TMBM to drift away from the landing site, during which images would be taken along the ground.

Author

Mars (Planet); Mars Exploration; Mars Missions; Balloon-Borne Instruments; Microballoons; Tethered Balloons

20010020654 NASA Langley Research Center, Hampton, VA USA

Parametric Fin-Body and Fin-Plate Database for a Series of 12 Missile Fins

Allen, Jerry M., NASA Langley Research Center, USA; January 2001; 305p; In English

Contract(s)/Grant(s): RTOP 522-25-31-03

Report No.(s): NASA/TM-2001-210652; NAS 1.15:210652; L-18023; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

A cooperative experimental investigation has been performed to obtain a systematic fin-body and fin-plate database for a series of 12 missile fins. These data are intended to complement and extend the information contained in the Triservice missile project and to provide a systematic set of experimental data from which fin-body interference factors can be derived. Data were obtained with the fins mounted on both an axisymmetric body and on a flat plate that was used to simulate fin-alone measurements. The experiments were conducted at Mach numbers from 0.60 to 3.95; fin deflection angles of 0 deg, 10 deg, and -10 deg; and angles of attack up to 30 deg on the body and up to 95 deg on the flat plate. The data were obtained from three-component balances attached to the fins and a six-component balance located in the axisymmetric body. The data obtained in this project are documented in tabular form in this report. In addition, selected data are presented in graphical form to illustrate the effects of the test variables. These variables are configuration angle of attack; Mach number; and fin parameters of deflection angle, planform size,

taper ratio, and aspect ratio. A very limited comparison with the Triservice missile data is made to illustrate the consistency between the data from these two projects.
Author
Data Bases; Experimentation; Axisymmetric Bodies; Fins; Flat Plates

20010021136 NASA Langley Research Center, Hampton, VA USA
Development of a Semi-span Test Capability at the National Transonic Facility (Invited)
Gatlin, G. N., NASA Langley Research Center, USA; Parker, P. A., NASA Langley Research Center, USA; Owens, L. R., Jr., NASA Langley Research Center, USA; [2001]; 34p; In English; 39th; Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2001-0759; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A need for low-speed, high Reynolds number test capabilities has been identified for the design and development of advanced subsonic transport high-lift systems. In support of this need, multiple investigations have been conducted in the National Transonic Facility (NTF) at the NASA Langley Research Center to develop a semi-span testing capability that will provide the low-speed, flight Reynolds number data currently unattainable using conventional sting-mounted, full-span models. Although a semi-span testing capability will effectively double the Reynolds number capability over full-span models, it does come at the expense of contending with the issue of the interaction of the flow over the model with the windtunnel wall boundary layer. to address this issue the size and shape of the semi-span model mounting geometry have been investigated, and the results are presented herein. The cryogenic operating environment of the NTF produced another semi-span test technique issue in that varying thermal gradients have developed on the large semi-span balance. The suspected cause of these thermal gradients and methods to eliminate them are presented. Data are also presented that demonstrate the successful elimination of these varying thermal gradients during cryogenic operations.
Author
Transonic Wind Tunnels; Semispan Models; Wind Tunnel Tests; Three Dimensional Models

20010021159 Purdue Univ., Dept. of Earth and Atmospheric Sciences, West Lafayette, IN USA
A Proposal for Equipment for Intelligent Aeroelastic Systems: Advanced Instrumentation for Unsteady Aerodynamic and Aeromechanics of Multi-Stage Turbomachinery Blading ***Final Report, 1 Apr. - 9 Mar. 1998***
Lee, Charles Y-C; Dec. 13, 2000; 6p; In English
Contract(s)/Grant(s): F49620-97-1-0249
Report No.(s): AD-A385720; AFRL-SR-BL-TR-00-0794; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

High Cycle Fatigue (HCF) is a fundamental weakness in the technology base for turbine engines. to avoid surprise HCF failures or to design blades for longer life, accurate vibratory stress predictions are crucial. This requires validated design systems. As multistage blade row interactions drive most HCF problems the key barrier research issue is MultiStage Interaction Steady and Unsteady Aerodynamics. Hence, multistage forcing functions, their mutual interaction, and the resultant blade row steady and unsteady aerodynamic response, including three-dimensional and transonic flow conditions, must be addressed. to validate or direct the development of advanced models and the complete aeroelastic design system, data obtained in an appropriate multistage flow environment are required. of particular interest is defining these three-dimensional blade row flow fields with enough detail for use in CFD code verification and development, thereby enabling the limits of applicability and the modeling inherent in the various codes to be addressed. to accomplish this, first appropriate experimental facilities which experimentally model the fundamental three dimensional steady and unsteady flow' phenomena are required. These are either currently available or are in progress funded by AFOSR at Purdue University. Hence, the key experimental issue is nonintrusive instrumentation capable of three-dimensional whole flow field measurements. Under this grant, instrumentation has been acquired to be utilized to quantify the three-dimensional blade row steady and instantaneous blade-to-blade velocity field.
DTIC
Aeroelasticity; Computational Fluid Dynamics; Unsteady Aerodynamics; Turbomachinery; Turbine Engines; Turbine Blades; Unsteady Flow; Rotor Blades (Turbomachinery)

20010021398 Grenoble-1 Univ., Lab. de Modelisation et Calcul, France
Optimization of Trailing Vortex Destruction by Evolution Strategies
Cottet, G.-H., Grenoble-1 Univ., France; Sbalzarini, I., Eidgenoessische Technische Hochschule, Switzerland; Mueller, S., Eidgenoessische Technische Hochschule, Switzerland; Koumoutsakos, P., Eidgenoessische Technische Hochschule, Switzerland; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 75-82; In English; See also 20010021392; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We apply evolution strategies to optimize the instability growth of several pairs of vortices which model the wake of airplanes in landing configuration. For the case of two pairs, the evolution strategy finds a set of optimal parameters strikingly similar to those found in the linear stability analysis of Crouch (1997). The case of four pairs is also considered and leads to a larger distortion of the tip vortex.
Author
Optimization; Turbulent Wakes; Aircraft Wakes; Vortex Alleviation; Genetic Algorithms

03
AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety; and 85 Technology Utilization and Surface Transportation.

20010020045 National Transportation Safety Board, Washington, DC USA
Annual Review of Aircraft Accident Data: U.S. General Aviation, Calendar Year 1997
Sep. 2000; 70p; In English
Report No.(s): PB2000-108038; NTSB/ARG-00/01; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report presents a statistical review of these accidents for calendar year 1997, all involving U.S. registered aircraft that were not conducting air carrier revenue operations under Title 14 Code of Federal Regulations (14 CFR) Parts 121 or 135. The accident data on which this review is based were extracted from the Safety Board's automated Aviation Accident Data System.
NTIS
Air Transportation; Aircraft Accidents; General Aviation Aircraft

20010020052 Federal Aviation Administration, Washington, DC USA
FAA Strategic Plan, June 2000
Jun. 2000; 56p; In English; Original contains color illustrations
Report No.(s): PB2001-102474; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
In the fall of 1997, the newly appointed FAA Administrator and her senior management team completed work on the goals that will carry the FAA and aerospace into the new millennium. The 1998 FAA Strategic Plan set out these goals, areas for strategic focus, projects to implement them, and outcome performance goals and measures. The Strategic Plan mission, goals, and strategies (focus areas) established in 1998 remain unchanged. This edition of the Strategic Plan document adds a discussion of the aerospace environment under multiple possible futures and describes current outcome performance goals for the next 5 years and current projects to implement this plan. The Strategic Plan is focused around three mission goals: safety, security, and system efficiency. These aerospace goals stem directly from FAAs legal charter and support the Department of Transportations (DOT) 1998 and 2000 Strategic Plans. This plan includes strategies and outcome performance measures for each goal.
NTIS
Civil Aviation; Air Traffic Control; Aerospace Environments

20010020133 Tel-Aviv Univ., Ramat-Aviv, Tel-Aviv Israel
Migrating Birds Know No Boundaries. Proceedings of the International Seminar on Birds and Flight Safety in the Middle East, Israel, April 25-29, 1999
Leshem, Yossi; Mandelik, Yael; Shamoun-Baranes, Judy; Apr. 29, 1999; 308p; In English
Contract(s)/Grant(s): F61775-99-WF042
Report No.(s): AD-A385711; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
This is an interdisciplinary conference. Topics include applying bird migration research to bird strike avoidance, development of NEXPAD-based Aircraft Hazard Advisory System, the U.S. Bird Avoidance Model (BAM), birds and flight safety. Table of Contents: Developing a real time warning system in the Middle East - from vision to reality; The Royal Netherlands Air Force: Two decades of bird strike prevention 'En Route'; Bird flight forecast and information system; Next generation satellite-based technology for conservation and bird strike science; The Avian Hazard Advisory System; Three decades of tracking radar studies on bird migration in Europe and the Middle east; Review of 100 years of military; Aerodrome bird hazard prevention: case study at John F. Kennedy International Airport; The role and value of awareness programs in reducing bird hazards to aircraft; Conflict in the Royal Jordanian Air Force; Bird strikes and flight safety in the Turkey Air Force; Avifauna management policy of the Hel-

lenic Air Force; USA Air Force Europe bird strike hazard reduction; Bird Remains Identification System (BRIS) - from a bi-national to a global database; From a local to regional ground survey network and its application in flight safety; Twenty-eight years of birdstrike damage in the Israel Air Force (IAF) 1972-1999; The USA Avoidance Model (HAM); Development of a GIS-based birds model migration model for the Middle East; A new technique for studying nocturnal bird migration; WSR-88D/98 Doperational capabilities and applications. Weather and biological targets; Factors affecting bird hazards in and around Israeli aerodromes; Factors affecting bird hazards in and around Israeli aerodromes; Pigeon and crow population control by trapping; Summary and action plan.
DTIC
Israel; Middle East; Birds; Conferences; Flight Safety

20010020168 Martin Marietta Corp., Information and Communications Systems, Washington, DC USA
National Airspace System Interface Management Plan
Jan. 1986; 52p; In English
Report No.(s): PB2001-102168; ATC-85-1070; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This document is intended to implement Interface Management for interfacing subsystems of the National Airspace System (NAS) and for external NAS interfaces by establishing a process which assures that: Interface requirements are agreed to by interfacing managers and complied with as the development of interfacing subsystems progresses. Interface requirements and designs are formally documented and controlled. No change which affects interfacing compatibility will be initiated in a design without coordination and agreement between affected subsystems. These goals are accomplished by continuous systematic surveillance of design development for both hardware and software, NAS system level requirements, subsystem specifications, interface control documentation, and design drawings.
NTIS
National Airspace System; Computer Programs; Management Planning

20010020237 Federal Aviation Administration, Office of Aviation Policy and Plans, Washington, DC USA
FAA Airport Benefit-Cost Analysis Guidance
Dec. 15, 1999; 132p; In English
Report No.(s): PB2001-102473; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

The purpose of this document is to provide clear and thorough guidance to airport sponsors on the conduct of project-level benefit-cost analysis (BCA) for capacity-related airport projects. It will facilitate the production of c onsistent, thorough, and comparable analyses that can be used by the Federal Aviation Administration (FAA) in its consideration of airport projects for discretionary funding under the Airport Improvement Program (AIP). Airport sponsors should conform to the general requirements of this guidance for all BCAs submitted to FAA. However, airport sponsors are encouraged to make use of innovative methods for quantifying benefits and costs where these methods can be shown to yield superior measures of project merit.
NTIS
Airports; Cost Effectiveness

20010020272 Mitre Corp., Civil Systems Div., McLean, VA USA
Analysis of Static Information Display Requirements for the Advanced Automation System
Jacobsen, W. E., Mitre Corp., USA; Treupel, H., Mitre Corp., USA; Mar. 1987; 68p; In English; Portions of this document are not fully legible
Report No.(s): PB2001-102175; MTR-86W174; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The Advanced Automation System (AAS) for air traffic control is specified to include electronic displays of static data such as charts, approach plates and handbooks. The static information currently used by air traffic controllers is examined in the report and candidates for incorporation into the system are identified. Availability of digitized data required for establishing and maintaining a central data base is examined. Findings from controller interviews, including display requirements for static information, are documented and evaluated. Changes to the static display requirements delineated in the AAS System Level Specification (SLS) are suggested, and further extensions of the study are proposed.
NTIS
Information Systems; Air Traffic Control; Display Devices

20010020286 Civil Aeromedical Inst., Oklahoma City, OK USA

Access-to-Egress: A Meta-Analysis of the Factors that Control Emergency Evacuation Through the Transport Airplane Type-III Overwing Exit ***Final Report***

McLean, Garnet A., Civil Aeromedical Inst., USA; January 2001; 30p; In English

Contract(s)/Grant(s): AM-B-00-PRS-93

Report No.(s): DOT/FAA/AM-01/2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The factors that control emergency evacuation from transport aircraft are many. The physical factors include the aircraft structure and the configuration of aircraft interior components such as aisles, seating arrangements, monument placements, and crewmember assist spaces. Information factors related to emergency evacuation include safety briefing cards and videos, signs, placards, emergency lighting, and marking systems, and verbal briefings by the crew. Trained crewmembers perform the functions necessary to initiate and conduct emergency evacuations, providing passenger management functions intended to produce fast and effective evacuations. Individual passengers have a large, typically negative, impact on the conduct of emergency evacuations, resulting from their general naivete regarding aircraft emergencies and the proper procedures needed to cope with such circumstances. Egress through the Type-III overwing exit is particularly susceptible to this deficiency, since passengers typically must operate the exit as well as use it. Research efforts conducted to define the relative contributions of these factors have been focused to a large degree on the interior configuration of transport aircraft, attempting to establish the appropriate access-to-egress required. These studies have employed an array of techniques and posited an assortment of experimental questions designed to address the issue, resulting in a comprehensive body of evidence related to access-to-egress, particularly for the Type-III exit. Additional information has been provided about many of the other factors that also exert control of evacuations, allowing assessments to be made regarding the relative importance of individual factors, and their various combination(s), on the outcome of emergency evacuations. This analytical review of the studies conducted to address access to the Type-III exit has confirmed that human factors effects related to passengers present the biggest challenge to the execution of successful evacuations. Deficiencies that may exist regarding configural and informational egress factors are expressed through their interactions with these human factors effects, which has often made determination of specific deficiencies more difficult. Solutions to overcoming deficiencies must address both the specific deficiency and its interactiveness.

Author

Evacuating (Transportation); Passengers; Human Factors Engineering; Emergencies; Human Performance

20010020304 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Web-Based Flight Test Training and Mishap Investigation Support

Carico, Dean; He, Chengjian; Blemel, Peter; Jan. 2001; 11p; In English; Prepared in collaboration with Advanced Rotorcraft Technology, Mountain View, CA, and Management Sciences, Inc., Albuquerque, NM.

Report No.(s): AD-A385565; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Work is ongoing to develop a web-based capability to support flight testing and mishap investigations. Fewer new aircraft are being procured today compared to aircraft procurement a couple decades ago. As the older members of the test force retire or change jobs, more pressure is placed on the more junior engineers to conduct the testing. Flight test training is accomplished at government and commercial test pilot schools, but after graduating the flight test engineers and pilots must primarily work with on-the-job training. One approach to improve flight test training support, currently being developed as part of a small business innovative research program, involves combining advanced technology programs associated with a physics-based analysis model Structure and the World Wide Web. This paper discusses the results of the ongoing program to enhance and integrate an advanced simulation model structure with a collaborative network and with advanced microprocessors.

DTIC

World Wide Web; Engineers; Personnel Development; Flight Training; Pilots

20010020370 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA

Gateway, Volume 8

Vicente, Kim; Schopper, Aaron; Card, Stuart; Hann, Rueben L.; Aug. 1997; 17p; In English

Contract(s)/Grant(s): SPO900-94-D-0001

Report No.(s): AD-A385473; CSERIAC-GWVIII1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This issue contains articles on the following subjects: (1) Should an Interface Always Match the Operator's Mental Model; (2) Information Visualization and Information Foraging; (3) A Conversation with Stuart Card; (3) Aircraft Mishap Investigation: A Role for Human Factors Consultants.

DTIC

Human Factors Engineering; Accident Prevention; Human-Computer Interface

20010020447 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Reducing NVG-Related Spatial Disorientation Mishaps

Antonio, Joseph; Nov. 2000; 6p; In English

Report No.(s): AD-A385520; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

NVGs have been in use for a number of years but there are still lessons to be learned. There is no need to wait for the next mishap to take action. Being proactive may result in saved lives and will help win the war of attrition. This may require a new way of looking at the way business is being conducted.

DTIC

Night Vision; Visual Aids; Display Devices; Disorientation

20010020754 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA

Assessment of the Communications, Navigation, Surveillance (CNS) Capabilities Needed to Support the Future Air Traffic Management System

Thompson, S., Massachusetts Inst. of Tech., USA; Spencer, D., Massachusetts Inst. of Tech., USA; Andrews, J., Massachusetts Inst. of Tech., USA; Jan. 10, 2001; 60p; In English

Report No.(s): PB2001-102431; ATC-295; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The purpose of this study was to assess the Communications, Navigation, and Surveillance (CNS) capabililities needed to support future Air Traffic Management (ATM) functionality in the National Airspace System (NAS). The goal was to determine the most effective areas for research and technical development in the CNS field and to make sure the decision support tools under development match future CNS capabilities. The requirement for future ATM functions were derived from high level operational concepts designed to provide more freedom and flexibility in flight operations and from the Joint Research Project Descriptions (JRPDs) that are listed in the Integrated Plan for Air Traffic Management Research and Technology Development. This work was performed for the FAA/NASA Interagency Air Traffic management Integrated Product Team.

NTIS

Air Traffic Control; Telecommunication; Navigation; Research and Development

20010020758 Federal Aviation Administration, Washington, DC USA

Mode Select (MODE S) Surveillance and Communications, ATC and Non-ATC Link Protocols, and Message Formats

Jul. 12, 1985; 60p; In English

Report No.(s): PB2001-102189; FAA-RD-80-14A; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The Mode Select Beacon System is an evolutionary upgrading of the Air Traffic Control Radar Beacon System (ATCRBS). Mode S provides improved surveillance and an integral ground-air-ground digital data link for transmission of Air Traffic Control (ATC) communication messages and other user messages. It is the purpose of this report to specify the message transport and link protocols between Mode S sensors and the National Airspace System (NAS). The report treats surveillance interfaces separately from communications interfaces. The surveillance transport and link will be used to interface the Mode S system with Air Traffic Control (ATC) systems, this includes: ARTS-IIA, ARTS-IIIA, 9020 computer, Host computer and Direct Access Radar Channel. Communications transport and link are defined with a listing of all message types. Message formats are categorized according to user type.

NTIS

Air Traffic Control; Data Links; Protocol (Computers); Surveillance; Messages; Radar Beacons

20010021193 Mitre Corp., Civil Systems Div., McLean, VA USA

Statistical Profile of Conflict Alert Encounter Situations

McGuire, R. L.; Lejeune, R. O.; Aug. 1987; 188p; In English

Report No.(s): PB2001-102173; MTR-87W56; No Copyright; Avail: National Technical Information Service (NTIS)

During the Acquisitions Phase of the Advanced Automation System (AAS) procurement, the AAS Contractor is required to document the performance of the Conflict Alert function. The Contractor is required to develop aircraft-to-aircraft encounter scenarios to be used to demonstrate the performance of this function. These scenarios must conform to the characteristics of conflict situations as found in a realistic traffic mix. These characteristics, determined from an analysis of actual traffic, are documented in this report.

NTIS

Statistical Analysis; Automatic Control; Air Traffic Control; Flight Management Systems; Encounters

20010021194 Mitre Corp., Civil Systems Div., McLean, VA USA

Statistical Profile of MSAW Encounter Situations

Boone, D.; Waters, T.; Aug. 1987; 338p; In English

Report No.(s): PB2001-102172; MTR-87W57; No Copyright; Avail: National Technical Information Service (NTIS)

This report provides a statistical characterization of en route and terminal Minimum Safe Altitude Warning (MSAW) encounter situations. The characteristics were obtained by analyzing recorded Federal Aviation Administration (FAA) field data for MSAW encounters that occurred in Albuquerque, Fort Worth, and New York en route to airspace and Houston, Los Angeles, and New York terminal airspace. Encounter parameters discussed in this report include aircraft velocity and track stability, position relative to the protected airspace, and position relative to the radar site. This information is intended for use by the FAA's Advanced Automation System (AAS) Acquisition Phase Contractor to generate scenarios representative of realistic aircraft-to-aircraft encounters that will be used for performance analysis of the AAS MSAW function.

NTIS

Statistical Analysis; Automatic Control; Management Systems; Encounters; Air Traffic Control; Altitude

20010021301 Mitre Corp., METREK Div., McLean, VA USA

Departure Coordination Tool Demonstration User's Manual

Jenny, M. T.; Bailey, S. J.; Smith, A. P.; Dec. 1985; 42p; In English

Report No.(s): PB2001-102169; MTR-85W188; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Departure Coordination Tool has been designed as an experiment to assist the Traffic Management Unit (TMU) at the Los Angeles Air Route Traffic Control Center (ARTCC) in coordinating departures from the Los Angeles basin airports in response to externally and internally generated restrictions. This tool performs the bookkeeping and communications tasks that are currently performed in a manual mode. This user's guide provides step-by-step guidance on the use of all the functions of the Departure Coordination Tool. It is divided into three self-contained sections that describe the procedures for interacting with the three types of man-machine interface devices in the system.

NTIS

User Manuals (Computer Programs); Air Traffic Control; Man Machine Systems

20010021302 Federal Aviation Administration, Washington, DC USA

FAA Future Telecommunications Plan (Fushia Book)

Apr. 2000; 944p; In English; See also AD-A249-133/0

Report No.(s): PB2001-101891; DOT/FAA/AOP-400; No Copyright; Avail: National Technical Information Service (NTIS)

The TSP is FAA's highest level telecommunications planning document. It specifies the vision for FAA telecommunications to which newly planned programs and systems should conform. It defines future agency and Air Traffic Control requirements, security considerations, integrated communications architecture, and a concept for operations, administration, and maintenance of FAA telecommunications. In addition to establishing the strategic planning vision for FAA telecommunications, the TSP recommends transition strategies that should guide future programs.

NTIS

Telecommunication; Air Traffic Control; Management Planning

20010021374 Computer Technology Associates, Inc., Englewood, CO USA

AERA 2 Operations Concept ***Final Report***

Coleman, B., Computer Technology Associates, Inc., USA; Gundersen, N., Computer Technology Associates, Inc., USA; Murphy, E., Computer Technology Associates, Inc., USA; Rooney, P., Computer Technology Associates, Inc., USA; Shannon, R., Computer Technology Associates, Inc., USA; Jan. 31, 1986; 298p; In English

Contract(s)/Grant(s): DTFA01-85-4-01008

Report No.(s): PB2001-102197; Copyright; Avail: CASI; A03, Microfiche; A13, Hardcopy

This document describes the operational interaction between the ACF air traffic controller and the AERA 2 system. The controller's job is categorized into activities, sub-activities, and tasks. Individual tasks are characterized in terms of information requirements, required cognitive/sensory abilities, human performance factors, and recommended tools to support controller performance.

NTIS

Air Traffic Controllers (Personnel); Systems Analysis; Human Factors Engineering; Flight Management Systems; Flight Operations; Human-Computer Interface; Decision Support Systems

20010021376 Analytical Technology Applications Corp., Mountain View, CA USA

Departure Flow Management Testbed Software Documentation. Task 2 Report

Olmstead, Jeffrey R., Analytical Technology Applications Corp., USA; McWhinney, Mark S., Analytical Technology Applications Corp., USA; Wolf, Daniel E., Analytical Technology Applications Corp., USA; Henninger, Derek P., Analytical Technology Applications Corp., USA; Whitson, Alan L., Analytical Technology Applications Corp., USA; May 1987; 218p; In English

Report No.(s): PB2001-102190; FAA/AES-320; Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

The Departure Flow Management (DFM) project was funded by the FAA's System Engineering Service, System Engineering/Advanced Concepts Division, Advanced Concepts Branch, AES-320. The DFM project involved the design, analysis, development, test, evaluation, and documentation of a computer automation system to improve the coordination of aircraft departures in a congested metropolitan area. This report is the last in the DFM series; it documents the DFM testbed computer software used in tests during the fall of 1986 in New York. Previous reports provide details about the DFM concept, analysis, and test results. This report describes the DFM testbed software, which consisted of two major sets of programs: Center software and tower/TRACON software.

NTIS

Air Traffic Control; Computer Programs; Systems Engineering; Automatic Control

20010021514 Civil Aeromedical Inst., Oklahoma City, OK USA

Distribution of Butalbital in Biological Fluids and Tissues ***Final Report***

Lewis, R. J., Civil Aeromedical Inst., USA; Southern, T. L., Civil Aeromedical Inst., USA; Canfield, D. V., Civil Aeromedical Inst., USA; Aug. 2000; 12p; In English

Contract(s)/Grant(s): AM-B-00-TOX-202

Report No.(s): PB2001-102919; DOT/FAA/AM-00/29; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

During the investigation of fatal aviation accidents, postmortem samples from the pilot/copilot are submitted to the Federal Aviation Administrations (FAAs) Civil Aeromedical Institute for toxicological analysis. Blood specimens are received in approximately 70% of the fatal aviation accidents analyzed by the FAAs Toxicology and Accident Research Laboratory. The lack of blood available is usually due to the severe damage to a pilots body during an aviation accident and/or to the length of time taken to recover the body following an accident. Therapeutic and toxic levels for most drugs are reported in the scientific literature for blood and plasma only. Therefore, it is imperative for an accident investigator and forensic toxicologist to be able to estimate drug concentrations in a fatal aviation accident victims blood from the available concentrations in the tissue. This is exemplified by a recent aviation fatality where butalbital was identified in muscle tissue of a pilot, and the investigators wanted to know the approximate butalbital concentration expected in the victims blood. Butalbital, a short-acting barbiturate found in combination with other drugs such as acetaminophen, aspirin, codeine, and caffeine, is commonly prescribed for the treatment of tension headaches. Certain side effects of butalbital, such as drowsiness, sedation, dizziness, and a feeling of intoxication, could affect pilot performance and become a significant factor in an aviation accident. Thus, our laboratory determined the distribution of butalbital in various postmortem tissues and fluids.

NTIS

Tissues (Biology); Toxicology; Aerospace Medicine; Aircraft Accident Investigation; Aircraft Accidents

20010021515 Civil Aeromedical Inst., Oklahoma City, OK USA

Abnormal Glucose Levels Found in Transportation Accidents ***Final Report***

Canfield, D. V., Civil Aeromedical Inst., USA; Chaturvedi, A. K., Civil Aeromedical Inst., USA; Boren, H. K., Civil Aeromedical Inst., USA; Veronneau, S. J. H., Civil Aeromedical Inst., USA; White, V. L., Civil Aeromedical Inst., USA; Jun. 2000; 20p; In English

Contract(s)/Grant(s): AM-B-98-TOX-202

Report No.(s): PB2001-102917; DOT/FAA/AM-00/22; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Federal Aviation Administration's Office of Aviation Medicine (OAM) is responsible for the certification of pilots with diabetic conditions. Therefore, it is essential for OAM to monitor pilots involved in fatal accidents for abnormal glucose levels, which might have caused performance impairment/ incapacitation. The present study evaluated the use of postmortem vitreous humor and urine glucose levels in transportation accident fatalities as indicators of potentially incapacitating medical conditions or performance impairment. Vitreous humor and/or urine from 192 accident fatalities were analyzed for glucose using a hexokinase method. Cases with values below the lower limit of detection (10 mg/dL) and above 3 standard deviations (SD) from the mean were not included in the final statistics. All cases more than 5 SD above the mean were deemed abnormal and a full case history was evaluated based on the available medical history. The mean glucose concentration was 30 mg/dL (SD: 21 mg/dL) from 98 postmortem vitreous humor specimens, while it was 27 mg/dL (SD: 16 mg/dL) from 127 postmortem urine samples. Nine of the

192 cases were identified as having abnormal glucose levels. Abnormal glucose levels were found in 5 of the 8 cases with a known diabetic condition. Glycosuria or low renal threshold was reported in 2 fatal pilots; 1 of these pilots had an abnormal glucose level. Hyperglycemia can be established from the vitreous humor and urine glucose levels, but hypoglycemia cannot, because of the rapid postmortem drop in vitreous humor glucose levels. All of the pilot abnormal glucose cases detected were previously identified during the medical certification process or had a medical reason for the abnormal level. The elevated vitreous humor and urine glucose levels have proven useful in identifying individuals with a pre-existing diabetic condition that might have been a factor in the accident.
NTIS
Glucose; Aerospace Medicine; Transportation; Abnormalities; Metabolic Diseases; Aircraft Accidents; Accident Investigation

20010021526 Sandia National Labs., Albuquerque, NM USA
FAA Fluorescent Penetrant Laboratory Inspections
Windes, C. L.; Moore, D. G.; Aug. 02, 2000; 10p; In English
Report No.(s): DE00-761845; SAND2000-1953C; No Copyright; Avail: National Technical Information Service (NTIS)

The Federal Aviation Administration Airworthiness Assurance NDI Validation Center currently assesses the capability of various non-destructive inspection (NDI) methods used for analyzing aircraft components. The focus of one such exercise is to evaluate the sensitivity of fluorescent liquid penetrant inspection. A baseline procedure using the water-washable fluorescent penetrant method defines a foundation for comparing the brightness of low cycle fatigue cracks in titanium test panels. The analysis of deviations in the baseline procedure will determine an acceptable range of operation for the steps in the inspection process. The data also gives insight into the depth of each crack and which step(s) of the inspection process most affect penetrant sensitivities. A set of six low cycle fatigue cracks produced in 6.35-mm thick Ti-6Al-4V specimens was used to conduct the experiments to produce sensitivity data. The results will document the consistency of the crack readings and compare previous experiments to find the best parameters for water-washable penetrant.
NTIS
Fluorescence; Penetrants; Inspection; Aircraft Reliability

20010021552 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Biomedical Review of Aircrew Weight as a Risk Factor in CT 133 and CT 114 Ejections: 1970 - 1998
Wright, H. L.; Salisbury, D. A.; Bateman, W. A.; Aug. 15, 2000; 35p; In French
Report No.(s): AD-A385589; DCIEM-TM-2000-100; Copyright; Avail: Issuing Activity

This review was undertaken in Jan 1999 in response to growing concern over Canadian Forces CT133 and CT114 aircraft ejection safety. Occupant weight was a suspected risk factor for serious injury or death during an ejection. A review of literature and examination of all CT133 and CT144 accident reports from 1970-98 was done to investigate occupant weight as a risk factor during all phases of ejection (firing of the seat, wind blast and tumbling, seat-person separation, opening shock, landing forces, and post-landing factors). Heavy weight does not appear to be a significant risk factor for major injury or death from a biomedical perspective, although further study is recommended to clearly establish the influence of mass and body size on tumbling and seat-person separation. Heavy weight does lead to higher descent rates and possibly associated landing injury, although our data cannot establish this, nor can it rule out influence of inadequate training in landing technique. Light weight may be a risk factor with respect to injury associated with acceleration, tumbling and opening shock. It should be noted that there may be engineering concerns regarding these specific ejection systems that are outside the scope of this review.
DTIC
Aircraft Safety; Flight Crews; Ejection; Body Weight; Accident Prevention; Accident Investigation

20010021623 Civil Aeromedical Inst., Oklahoma City, OK USA
Human Factors Analysis and Classification System-HFACS ***Final Report***
Shappell, S. A.; Wiegmann, D. A.; Feb. 2000; 24p; In English
Contract(s)/Grant(s): FAA-OAM-99-G-006
Report No.(s): PB2001-102910; DOT/FAA/AM-00/7; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Human error has been implicated in 70 to 80% of all civil and military aviation accidents. Yet, most accident reporting systems are not designed around any theoretical framework of human error. As a result, most accident databases are not conducive to a traditional human error analysis, making the identification of intervention strategies onerous. What is required is a general human error framework around which new investigative methods can be designed and existing accident databases restructured. Indeed, a comprehensive human factors analysis and classification system (HFACS) has recently been developed to meet those needs. Specifically, the HFACS framework has been used within the military, commercial, and general aviation sectors to systematically

examine underlying human causal factors and to improve aviation accident investigations. This paper describes the development and theoretical underpinnings of HFACS in the hope that it will help safety professionals reduce the aviation accident rate through systematic, data-driven investment strategies and objective evaluation of intervention programs. a
NTIS
Aircraft Accident Investigation; Human Factors Engineering; Human Performance; Error Analysis; Aircraft Accidents; Accident Prevention

20010021668 General Accounting Office, Washington, DC USA
National Airspace System: Observations on American Airlines' 1997 Study of Future Air Traffic Congestion
Jan. 29, 1999; 7p; In English
Report No.(s): PB2001-102230; GAO/RCED-99-66R; Copyright; Avail: National Technical Information Service (NTIS)
American Airlines' study focused on two scenarios of future air traffic conjection. Under the first scenario--most frequently cited by others--the study found that by 2005 airline flight delays would interfere with airline flight schedules and by 2014 these delays would have a crippling effect on scheduled flight operations.
NTIS
Air Traffic Control; Flight Control; Flight Plans; National Airspace System; Air Traffic

04
AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications; Spacecraft Communications, Command and Tracking, and 32 Communications and Radar.

20010019998 NASA Marshall Space Flight Center, Huntsville, AL USA
Testing the Preliminary X-33 Navigation System
Lomas, James J., NASA Marshall Space Flight Center, USA; Mitchell, Daniel W., NASA Marshall Space Flight Center, USA; Freestone, Todd M., NASA Marshall Space Flight Center, USA; Lee, Charles, Litton Systems, Inc., USA; Lessman, Craig, Litton Systems, Inc., USA; [2001]; 1p; In English; 24th; Guidance and Control, 31 Jan. - 4 Feb. 2001, Breckenridge, CO, USA; Sponsored by American Astronautical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only
The X-33 Reusable Launch Vehicle (RLV) must meet the demanding requirements of landing autonomously on a narrow landing strip following a flight that reaches an altitude of up to 200,000 feet and a speed in excess of Mach 9 with significant in-flight energy bleed-off maneuvers. to execute this flight regimen a highly reliable avionics system has been designed that includes three LN-100G Inertial Navigation System/Global Positioning System (INS/GPS) units as the primary navigation system for the X-33. NASA's Marshall Space Flight Center (MSFC) tested an INS/GPS system in real-time simulations to determine the ability of this navigation suite to meet the in flight and autonomous landing requirements of the X-33 RLV. A total of sixty-one open loop tests were performed to characterize the navigation accuracy of the LN-100G. Twenty-seven closed-loop tests were also performed to evaluate the performance of the X-33 Guidance, Navigation and Control (GN&C) algorithms with the real navigation hardware. These closed-loop tests were also designed to expose any integration or operational issues with the real-time X-33 vehicle simulation. Dynamic road tests of the INS/GPS were conducted by Litton to assess the performance of differential and nondifferential INS/GPS hybrid navigation solutions. The results of the simulations and road testing demonstrate that this novel solution is capable of meeting the demanding requirements of take-off, in-flight navigation, and autonomous landing of the X-33 RLV. This paper describes the test environment developed to stimulate the LN-100G and discusses the results of this test effort. This paper also presents recommendations for a navigation system suitable to an operational RLV system.
Author
X-33 Reusable Launch Vehicle; Autonomy; Spacecraft Landing; Navigation Aids; Performance Tests

20010020357 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
EGI Lessons Learned - A Common Thread
Gillin, Christine; Jan. 2000; 21p; In English
Report No.(s): AD-A385773; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper presents questions, comments, issues, anecdotes, data gathered from testing EGI integration on several different platforms.
Derived from text
Global Positioning System; Air Navigation; Systems Integration

20010020457 Naval Postgraduate School, Monterey, CA USA
Representing Tactical Land Navigation Expertise
Stine, Jason L., Naval Postgraduate School, USA; September 2000; 102p; In English
Report No.(s): AD-A383940; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy
Tactical land navigation is a very important, but extremely difficult task performed daily by small unit leaders. In an effort to find ways to develop expertise more efficiently, a detailed description of expert performance is presented and contrasted with novice and intermediate performance. This definition fits the Recognition Primed Decision model of human cognitive behavior. Then, through the use of the Critical Decision Method of Knowledge elicitation, interviews with experts at the US Army Special Forces Qualification Course formed the basis of a detailed cognitive model of expert tactical land navigation. Four important characteristics of experts emerge: (1) they rely on high-fidelity mental maps; (2) they blend multiple cues; (3) they adjust and recalibrate tools dynamically; and (4) they visualize spatial information. Finally, a multi-agent system computationally represents the route planning portion of the performance model.
Author
Human Behavior; Navigation; Performance Prediction

20010020935 Mitre Corp., Metrek Div., McLean, VA USA
AERA 2 System-Level Information Flows
Arthur, W. C.; Dubofsky, D. F.; Taber, N. J.; Sep. 1985; 166p; In English
Report No.(s): PB2001-102259; MTR-85W68; No Copyright; Avail: National Technical Information Service (NTIS)
A functional view of Automated En Route ATC 2 processing within the Advanced Automation System is presented. The AERA 2 functions are identified and located within the data processing activities of the AAS (AERA 1 processing is assumed to be present); processing responsibilities of the AERA 2 functions are addressed; data flows between AERA 2 functions and functions outside of AERA 2 are shown. This document is a product of a structured analysis and system specification technique, and the contents are exhibited accordingly. AERA 2 introduces an automated capability to derive, and display to an appropriately chosen air traffic controller, resolutions to traffic conflicts, airspace conflicts, predicted noncompliance with certain flow restrictions, and nonconformance problems. The emphasis of this system-level information flows document is to locate these new automation system activities within the context of the other data processing activities of the air traffic control system and to identify needed enhancements to existing data processing functions, especially those belonging to AERA 1.
NTIS
Air Traffic Control; Automatic Control; Air Navigation; Instrument Flight Rules; Automated En Route ATC; Data Processing; Information Flow

20010021513 Federal Highway Administration, Office of Operations Research and Development, McLean, VA USA
Investigation of the Use of Global Positioning System (GPS) Technology and Its Augmentations Within State and Local Transportation Departments
Jul. 2000; 68p; In English; Original contains color illustrations
Report No.(s): PB2001-102926; FHWA/RD-00/093; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
This report summarizes the results of an investigation conducted by the Federal Highway Administration's (FHWA's) Office of Operations Research and Development at the Turner-Fairbank Highway Research Center (TFHRC). This investigation targets the evolving character of applications utilizing Global Positioning System (GPS) technology and its augmentation for surface transporation, especially highway departments, on the State and local government level.
NTIS
Global Positioning System; Transportation

20010021548 Federal Highway Administration, ITS Joint Program Office, Washington, DC USA
Automatic Vehicle Location Successful Transit Applications. A Cross-Cutting Study: Improving Service and Safety
Aug. 2000; 24p; In English
Report No.(s): PB2001-102566; Copyright; Avail: National Technical Information Service (NTIS)

Automatic vehicle location (AVL) is a computer-based vehicle tracking system. For transit, the actual real-time position of each vehicle is measured and its location is relayed to a control center. Actual position determination and relay techniques vary, depending on the needs of the transit system and the technology (or technologies) chosen. Typically, vehicle position information is stored on the vehicle for a time, which can be as short as a few seconds or as long as several minutes. Position information can be relayed to the control center in raw form or processed on-board the vehicle before its transmission.
NTIS
Motor Vehicles; Urban Transportation; Computer Techniques; Global Positioning System

20010021620 Alabama Univ., Dept. of Psychology, Huntsville, AL USA
Improving Crash Location, Display, and Analysis by Combining CARE and GPS Technologies
Graettinger, A.; Anderson, M.; Aug. 31, 2000; 38p; In English
Report No.(s): PB2001-102755; Rept-99115; Copyright; Avail: National Technical Information Service (NTIS)

In the state of Alabama, crash locations are currently estimated by law enforcement officers at the scene of a crash. The locations are typically placed at identifiable points along the roadway such as mileposts and intersections. Because of this fact, a clustering effect is produced along highways which places most crashes at mileposts. The resulting resolution can locate vehicle crashes caused by the same roadway variable as far apart as 1.6 kilometers, making accurate identification of roadway safety hazards difficult. This research project was initiated through the University Transportation Center for Alabama (UTCA) to investigate improvements to vehicle crash analysis through accurate and inexpensive collection and display of crash location using global positioning system (GPS) and geographic information system (GIS) technologies. GPS units from $130 to $3300 were evaluated based on cost, accuracy, usability, additional equipment needed, and collection time. From this analysis two GPS units were selected: (1) a hand-held unit, the Garmin GPS 12 Map, and (2) a computer-based unit, the Rand McNally StreetFinder Deluxe.
NTIS
Crashes; Global Positioning System; Position (Location); Automobile Accidents; Accident Investigation

20010021622 Civil Aeromedical Inst., Oklahoma City, OK USA
Reduced Posting and Marking of Flight Progress Strips for En Route Air Traffic Control *Final Report*
Truitt, T. R.; Durso, F. T.; Crutchfield, J. M.; Moertl, P.; Manning, C. A.; Feb. 2000; 42p; In English; Original contains color illustrations
Contract(s)/Grant(s): FAA-OAM-96-G-040
Report No.(s): PB2001-102908; DOT/FAA/AM-00/5; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The new Display System Replacement (DSR) being implemented in air route traffic control centers (ARTCCs) will allow the data-side controller less room to post Flight Progress Strips (FPSs). We tested a new FPS marking and posting procedure designed to reduce the controllers need for, or reliance on, the FPS. The experiment was conducted at Cleveland (ZOB) and Jacksonville (ZJX) ARTCCs utilizing individual controllers and controller teams operating in either high- or low-altitude sectors. Each controller ran two, 30-minute scenarios. Scenarios were counter balanced, but sample sizes did not allow counter balancing of conditions. In the Normal scenario, controllers worked as they normally would. During the Experimental scenario, controllers were asked to remove FPSs that were not needed after radar contact and communications were established. Also, FPS marking was not required for any information that was recorded elsewhere, such as via computer entry or landline communication. Controllers responded to the Workload Assessment Keypad (WAK) every 5 minutes while a subject matter expert made performance ratings. Experimenters recorded activity relevant to the plan view display, computer readout device, and FPSs. At the end of each scenario, controllers provided a position relief briefing and completed a modified version of the NASA Task Load Index. For individuals and teams at ZOB and ZJX, results showed that controllers posted fewer FPSs and marked them less often in the experimental procedure. No detrimental effects on performance, workload, position relief briefings, or team communications were observed. On-line measures of workload (i.e., the WAK) were comparable and sometimes lower for the experimental condition. Most controllers reported that they preferred the experimental procedure.
NTIS
Air Traffic Control; Controllers; Flight Control

05
AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20010020016 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne Australia
Usage Spectrum Perturbation Effects on Helicopter Component Fatigue Damage and Life-Cycle Costs
Polanco, Frank G.; Nov. 2000; 40p; In English
Report No.(s): AD-A385730; DSTO-RR-0187; DODA-AR-011-606; Copyright; Avail: Defense Technical Information Center (DTIC)

The Australian Defence Force (ADF) operates rotary and fixed-wing aircraft in a different manner from the way that the aircraft manufacturers envisaged. That is, the usage spectra of the ADF aircraft are different from the usage spectra assumed by the aircraft manufacturer during design. The effects of perturbing the amount of time spent in flight conditions on both component fatigue damage and life-cycle costs are investigated in this report. An ”amplification factor” is developed, which allows the effect of varying the amount of time spent in different flight conditions on both damage and cost to be determined. These amplification factors give both qualitative (’importance’ ordering) and quantitative (sensitivity) information regarding all flight conditions. The resulting procedure is both easy to implement and use, and allows the operator to determine the effects of different spectra on both damage and cost. The outlined procedures will lead to cost savings and safety improvement for the ADF for both rotary and fixed-wing aircraft.
DTIC
Spectra; Perturbation; Fatigue (Materials); Damage; Life Cycle Costs; Aircraft Design

20010020291 Arnold Engineering Development Center, Arnold AFS, TN USA
Implementation of a Virtual Camera for Ground Simulation of Store Separation Flight Test Film Data ***Final Report, Aug. 1997-Dec. 1998***
Keen, K. S.; Dec. 2000; 49p; In English; Original contains color plates
Report No.(s): AD-A385749; AEDC-TR-99-9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High-speed film recorded by cameras mounted on a flight test aircraft is one of the primary means of obtaining inflight data about the motions of fuel tanks, bombs, missiles, and other stores during separation. This report describes the development and implementation of Computer graphics techniques to emulate the views of store release events expected to be obtained from flight test cameras positioned on the basis of re-flight ground simulations. The computer visualization can be used to help place and orient the cameras or optimum coverage of the expected store release motions.
DTIC
External Store Separation; High Speed Cameras; Fuel Tanks; Flight Tests

20010020389 NASA Langley Research Center, Hampton, VA USA
Advancement of Bi-Level Integrated System Synthesis (BLISS)
Sobieszczanski-Sobieski, Jaroslaw, NASA Langley Research Center, USA; Emiley, Mark S., George Washington Univ., USA; Agte, Jeremy S., Department of the Air Force, USA; Sandusky, Robert R., Jr., George Washington Univ., USA; December 2000; 14p; In English; 38th; Aerospace Sciences, 10-13 Jan. 2000, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 509-10-31-03
Report No.(s): NASA/TM-2000-210305; L-18000; NAS 1.15:210305; AIAA Paper 2000-0421; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Bi-Level Integrated System Synthesis (BLISS) is a method for optimization of an engineering system, e.g., an aerospace vehicle. BLISS consists of optimizations at the subsystem (module) and system levels to divide the overall large optimization task into sets of smaller ones that can be executed concurrently. In the initial version of BLISS that was introduced and documented in previous publications, analysis in the modules was kept at the early conceptual design level. This paper reports on the next step in the BLISS development in which the fidelity of the aerodynamic drag and structural stress and displacement analyses were upgraded while the method’s satisfactory convergence rate was retained.
Author
Parallel Processing (Computers); Systems Engineering; Design Analysis; Multidisciplinary Design Optimization; Aircraft Design

20010020536 NASA Ames Research Center, Moffett Field, CA USA

Use of Vertical Lift Planetary Aerial Vehicles for the Exploration of Mars

Young, L. A., NASA Ames Research Center, USA; Briggs, G. A., NASA Ames Research Center, USA; Derby, M. R., Aerospace Computing, Inc., USA; Aiken, E. W., NASA Ames Research Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 323-324; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Despite the thin, cold, carbon dioxide-based atmosphere of Mars, recent work at NASA Ames has suggested that vertical lift (based on rotary-wing technology) planetary aerial vehicles could potentially be developed to support Mars exploration missions. The use of robotic vertical lift planetary aerial vehicles (VL PAVs) would greatly augment the science return potential of Mars exploration. Many technical challenges exist in the development of vertical lift vehicles for planetary exploration. It only takes the realization that the world altitude record for a helicopter is less than 40,000 feet (versus flight at the equivalent terrestrial altitude of over 100,000 feet required to match Mars' surface atmospheric density) to appreciate the aeronautical challenges in developing these vehicles. Nonetheless, preliminary work undertaken at NASA Ames and others suggest that these vehicles are indeed viable candidates for Mars exploration.

Author

Mars Exploration; Mars Missions; Mission Planning; Vertical Flight; Spacecraft Design

20010020648 NASA Langley Research Center, Hampton, VA USA

Reynolds Number Effects on the Performance of Ailerons and Spoilers (Invited)

Mineck, R. E., NASA Langley Research Center, USA; [2001]; 24p; In English; 39th; Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-0908; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The influence of Reynolds number on the performance of outboard spoilers and ailerons was investigated on a generic subsonic transport configuration in the National Transonic Facility over a chord Reynolds number range from 3 to 30 million and a Mach number range from 0.70 to 0.94. Spoiler deflection angles of 0, 10, and 20 degrees and aileron deflection angles of -10, 0, and 10 degrees were tested. Aeroelastic effects were minimized by testing at constant normalized dynamic pressure conditions over intermediate Reynolds number ranges. Results indicated that the increment in rolling moment due to spoiler deflection generally becomes more negative as the Reynolds number increases from 3 x 10(exp 6) to 22 x 10 (exp 6) with only small changes between Reynolds numbers of 22 x 10(exp 6) and 30 x 10(exp 6). The change in the increment in rolling moment coefficient with Reynolds number for the aileron deflected configuration is generally small with a general trend of increasing magnitude with increasing Reynolds number.

Author

Reynolds Number; Ailerons; Spoilers; Subsonic Speed; Transonic Wind Tunnels; Body-Wing Configurations; Performance Prediction

20010021113 NASA Langley Research Center, Hampton, VA USA

Determining Aerodynamic Loads Based on Optical Deformation Measurements

Liu, Tianshu, NASA Langley Research Center, USA; Barrows, D. A., NASA Langley Research Center, USA; Burner, A. W., NASA Langley Research Center, USA; Rhew, R. D., NASA Langley Research Center, USA; [2001]; 12p; In English; 39th; Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA

Report No.(s): AIAA Paper 2001-0560; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a videogrammetric technique for determining aerodynamic loads based on optical elastic deformation measurements. The data reduction methods are developed to extract the normal force and pitching moment from beam deformation data. The axial force is obtained by measuring the axial translational motion of a movable shaft in a spring/bearing device. Proof-of-concept calibration experiments are conducted to assess the accuracy of this optical technique.

Author

Aerodynamic Loads; Optical Measurement; Mathematical Models; Elastic Deformation; Cantilever Beams

20010021138 NASA Langley Research Center, Hampton, VA USA

Hyper-X Program Status

McClinton, Charles R., NASA Langley Research Center, USA; Rausch, Vincent L., NASA Langley Research Center, USA; Sitz, Joel, NASA Dryden Flight Research Center, USA; Reukauf, Paul, NASA Dryden Flight Research Center, USA; [2001]; 14p; In English; 39th; Aerospace Sciences, 8-12 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. for Research, USA

Report No.(s): AIAA Paper 2001-0828; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper provides an overview of the objectives and status of the Hyper-X program, which is tailored to move hypersonic, airbreathing vehicle technology from the laboratory environment to the flight environment. The first Hyper-X research vehicle (HXRV), designated X-43. is being prepared at the Dryden Flight Research Center for flight at Mach 7. Extensive risk reduction activities for the first flight are completed, and non-recurring design activities for the Mach 10 X-43 (3rd flight) are nearing completion. The Mach 7 flight of the X-43, in the spring of 2001, will be the first flight of an airframe-integrated scramjet-powered vehicle. The Hyper-X program is continuing to plan follow-on activities to focus an orderly continuation of hypersonic technology development through flight research.
Author
X-43 Vehicle; Supersonic Combustion Ramjet Engines; Hypersonic Flight

20010021202 Air Force Research Lab., Wright-Patterson AFB, OH USA
USAF Manufacturing Technology Highlights. Summer 2000
Jan. 2000; 16p; In English
Report No.(s): AD-A385424; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Northrop Grumman Corporation, of Baltimore, MD, has developed an improved manufacturing process for F-22 aircraft radar components. The new process could result in a cost avoidance of nearly $87 million on the planned production run for the aircraft. The process replaces thousands of costly and labor intensive flex circuit interconnects on the radar's subarray components with improved automated ribbon bonds. This reduces the amount of hands-on labor and rework required and increases the number of acceptable arrays per production run. The F-22's APG-77 electronically scanned array antenna is composed of several thousand transmit/receive modules, circulators, radiators and manifolds assembled into subarrays and then integrated into a complete array. The baseline design used thousands of hand-soldered flex circuit interconnects to make the numerous radio frequency, digital, and direct current connections between the components and manifolds that make up the subarray. by replacing the hand-soldered flex circuit interconnects with automated ribbon bond interconnects, the first pass yield of the subarray assembly has been vastly improved. Touch labor and rework have been simultaneously reduced. The ribbon bonding process completely eliminates eight different part numbers associated with the flex circuits and can be readily reprogrammed in response to changes in subarray design.
DTIC
F-22 Aircraft; Antenna Arrays; Manufacturing; Radar Equipment; Aircraft Equipment

20010021209 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
A Client/Server Based Application Using a C/Java Interface
Gendron, Marlin L.; Edwards, Stephanie S.; Myrick, Stephanie A.; Lohrenz, Maura C.; Trenchard, Michael E.; Oct. 26, 2000; 10p; In English; Pub. in Proceedings of Southern Conference on Computing, University of Southern Mississippi, Hattiesburg, MS 26-28 Oct 2000.
Report No.(s): AD-A385437; NRL/PP/7440-00-1009; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Since 1995, the Naval Research Laboratory (NRL) at the Stennis Space Center (NRLSSC) has been developing and enhancing a software application that allows naval AV-8B and F/A-18 aircraft mission planners and aircrew to design and build digital aeronautical chart coverages for cockpit moving-map displays. The application, known as the Moving-Map Composer (MMC), currently is implemented in the X-Windows graphical user interface (GUI) language and the C programming language. Currently, MMC is only supported on Compaq Alpha computers running the OpenVMS operating system. This limitation requires end users to acquire Alpha stations, which are more expensive than standard Intel-based PC platforms. This paper will discuss reengineering methods being developed by NRLSSC to transform the existing MMC application to a Java and C-based program that will execute on many different hardware platforms and operating systems, including Linux, Windows NT and OpenVMS.
DTIC
C (Programming Language); Java (Programming Language); Graphical User Interface; Client Server Systems; Operating Systems (Computers); Computer Programs; F-18 Aircraft; Harrier Aircraft; Cockpits; Display Devices

20010021335 NASA Langley Research Center, Hampton, VA USA
Flying Wings/Flying Fuselages
Wood, Richard M., NASA Langley Research Center, USA; Bauer, Steven X. S., NASA Langley Research Center, USA; [2001]; 28p; In English; 39th; Aerospace Sciences, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2001-0311; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The present paper has documented the historical relationships between various classes of all lifting vehicles, which includes the flying wing, all wing, tailless, lifting body. and lifting fuselage. The diversity in vehicle focus was to ensure that all vehicle

types that may have contributed to or been influenced by the development of the classical flying wing concept was investigated. The paper has provided context and perspective for present and future aircraft design studies that may employ the all lifting vehicle concept. The paper also demonstrated the benefit of developing an understanding of the past in order to obtain the required knowledge to create future concepts with significantly improved aerodynamic performance.
Author
Aircraft Design; Lifting Bodies; Wings; Aerodynamic Configurations; Tailless Aircraft; Flight Characteristics

20010021659 Minnesota Univ., Dept. of Electrical Engineering, Minneapolis, MN USA
Robust Nonlinear Control of Piloted Tailless Fighters ***Final Report, 15 Apr. 1996 - 15 Sep. 1997***
Teel, Andrew R.; Dec. 1997; 10p; In English
Contract(s)/Grant(s): F49620-96-1-0144
Report No.(s): AD-A385195; AFRL-SR-BL-TR-00-0691; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Tools leading to effective control strategies for tailless fighter aircraft were developed. Emphasis was placed on the development of control algorithms that yield robust performance in the presence of actuator magnitude and rate limits. significant new tools for anti-windup synthesis were developed. The anti-windup problem is that of synthesizing modifications to an existing control system where the modifications are dormant when actuator limits are not active and the modifications maintain good performance when actuator limits are active. We applied these ideas to control a turbofan engine model, an F-l6 model, and Caltech's "ducted fan" experiment.
DTIC
Turbofan Engines; Nonlinear Systems; Tailless Aircraft; Active Control

06
AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20010021330 NASA Marshall Space Flight Center, Huntsville, AL USA
2000 Digital Avionics Highlights
Polites, Michael E., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

This article summarizes the highlights of recent events and developments in digital avionics in commercial aviation, military systems, and space. This article is about 1,200 words long. Information for the article was collected from other NASA centers, DoD, and industry. All information was previously cleared by the originating organizations. Information for the article was also gathered from Aviation Week and Space Technology and similar sources.
Author
Aerospace Engineering; Airline Operations; Digital Techniques

20010021331 NASA Marshall Space Flight Center, Huntsville, AL USA
2000 Guidance, Navigation, and Control Highlights
Polites, Michael E., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

This article summarizes the highlights of recent events and developments in guidance, navigation, and control in space, aircraft, and weapons. This article is about 1,200 words long. Information for the article was collected from other NASA centers, DoD, and industry. All information was previously cleared by the originating organizations. Information for the article was also gathered from Aviation Week and Space Technology, Space News, and similar sources.
Author
Guidance (Motion); Navigation; Spacecraft Control

07
AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

20010020311 Pennsylvania State Univ., Center for Gas Turbines and Power, University Park, PA USA
Methods of Desensitizing Tip Clearance Effects in Turbines ***Final Report, 1 Aug. 1999 - 31 Oct. 2000***
Tallman, J.; Lakshminarayana, B.; Oct. 2000; 101p; In English; Original contains color plates
Contract(s)/Grant(s): DAAD19-99-1-0335
Report No.(s): AD-A385533; PSU-CGTP-2000-09; ARO-40297.1-EG-11; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study is an attempt to reduce the effect of the leakage vortex in axial flow turbines. A 3D Navier-Stokes CFD solver with two equation turbulence modeling was used to compute the flow through an axial flow turbine with modified blade tip designs. The three modified blade tip designs each involved adding a chamfer to the tip of the blade, in an attempt to diffuse the leakage flow through the gap and obstruct the leakage flow with the outer casing's shear layer. A baseline flat tip case and three modified tip cases were simulated and the leakage flow and vortex for each was analyzed in detail. by chamfering the blade tip near the trailing edge of the gap, the leakage flow inside the gap was turned toward the direction of the blade's camber. This turning resulted in a decrease in the size and strength of the leakage vortex and its subsequent losses, while at the same time, did not reduce the blade loading by an appreciable amount.
DTIC
Navier-Stokes Equation; Axial Flow Turbines; Blade Tips; Computational Fluid Dynamics; Clearances; Leakage; Turbulence Models

20010020386 NASA Marshall Space Flight Center, Huntsville, AL USA
RLV Turbine Performance Optimization
Griffin, Lisa W., NASA Marshall Space Flight Center, USA; Dorney, Daniel J., NASA Marshall Space Flight Center, USA; [2000]; 8p; In English; 12th; PERC Propulsion Symposium, 26-27 Oct. 2000, Cleveland, OH, USA; Original contains color illustrations
Contract(s)/Grant(s): NRA8-21; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A task was developed at NASA/Marshall Space Flight Center (MSFC) to improve turbine aerodynamic performance through the application of advanced design and analysis tools. There are four major objectives of this task: 1) to develop, enhance, and integrate advanced turbine aerodynamic design and analysis tools; 2) to develop the methodology for application of the analytical techniques; 3) to demonstrate the benefits of the advanced turbine design procedure through its application to a relevant turbine design point; and 4) to verify the optimized design and analysis with testing. Final results of the preliminary design and the results of the two-dimensional (2D) detailed design of the first-stage vane of a supersonic turbine suitable for a reusable launch vehicle (R-LV) are presented. Analytical techniques for obtaining the results are also discussed.
Author
Reusable Launch Vehicles; Computational Fluid Dynamics; Gas Turbine Engines; Aerodynamic Characteristics; Design Optimization

20010020391 NASA Marshall Space Flight Center, Huntsville, AL USA
Fatigue Failure of Development Space Shuttle Main Engine Turbine Blades
Swanson, Gregory R., NASA Marshall Space Flight Center, USA; [2000]; 21p; In English; Fracture Control Methodology, 31 Oct. - 2 Nov. 2000, Huntsville, AL, USA; Sponsored by NASA, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 376-20-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This presentation focuses on the use of single crystal material, uniaxial LCF specimen data, and on development blade failure analysis.
CASI
Fatigue (Materials); Failure; Failure Analysis

20010021748 Massachusetts Inst. of Tech., Gas Turbine Lab., Cambridge, MA USA

Micro Gas Turbine Generators ***Final Report, 1 May 1995 - 31 Jul. 2000***

Epstein, A. H.; Breuer, K. S.; Lang, J. H.; Schmidt, M. A.; Senturia, S. D.; Dec. 2000; 23p; In English; Original contains color plates

Contract(s)/Grant(s): DAAH04-95-1-0093

Report No.(s): AD-A385644; ARO-33888.2-CH-MUR; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

MIT has developed the technology for micro-gas turbine generators. These are millimeter- to centimeter-size heat engines fabricated with semiconductor industry micromachining techniques (MEMS), ultimately capable of producing 10-100 W of power in less than a cubic centimeter. Applications include compact power sources offering energy and power densities an order of magnitude better than current battery technology; propulsion for small air vehicles; and a variety of microblowers, compressors, and heat pumps. The work was divided into 8 microscale disciplinary areas: (1) engine systems design, (2) turbomachinery fluid dynamics, (3) combustion, (4) structures, (5) bearings, (6) electromechanics, (7) silicon fabrication technology, and (8) microfabrication of high temperature materials and structures. Advances in the disciplinary technologies enabled the design and construction of a proof-of-principle 'demo engine'. This 20 mm square by 4 mm thick simple cycle gas turbine is designed to produce about 11 grams of thrust or 17 watts of shaft power. The design turbine inlet temperature is 1600 K and the rotational speed is 1.2M rpm. At the conclusion of this MURI, the first engines had been built and were just beginning testing. A companion microturbogenerator is a few months behind the gas turbine.

DTIC

Systems Engineering; Gas Turbines; Regenerators; Heat Engines; Heat Pumps; Micromotors

20010021755 California Univ., Dept. of Mechanical and Aerospace Engineering, Irvine, CA USA

Pollutant Emissions from and within a Model Gas Turbine Combustor at Elevated Pressures and Temperatures, ***1 Nov. 1989 - 7 Jan. 1992***

Drennan, G. A., California Univ., USA; Peterson, C. O., California Univ., USA; Khatib, F. M., California Univ., USA; Sowa, W. A., California Univ., USA; Samuelsen, G. S., California Univ., USA; AGARD Conference Proceedings; Jul. 10, 1993, pp. 28-1 - 28-10; In English; 81st, 10-14 May 1993, Fiuggi, Italy

Contract(s)/Grant(s): HHH451427; F08635-90-C-0100; NAG3-1124

Report No.(s): AD-A384013; AFRL-ML-TY-TP-2000-4569; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Conventional and advanced gas turbine engines are coming under increased scrutiny regarding pollutant emissions. This, in turn, has created a need to obtain in-situ experimental data at practical conditions, as well as in exhaust data, and to obtain the data in combustors that reflect modern designs. The in-situ data are needed to (1) assess the effects of design modifications on pollutant formation, and (2) develop a detailed data base for the development and verification of computer modeling. This paper reports on a novel high-pressure, high temperature facility designed to acquire such data under controlled conditions and with access (optical and extractive) for in-situ measurements. to evaluate the utility of the facility, a model gas turbine combustor was selected which features practical hardware design, two rows of jets (primary and dilution) with four jets in each row, and advanced wall-cooling techniques with laser-drilled effusive holes. The dome is equipped with a fault-vaned swirler with vane angles of 60 deg. Data are obtained at combustor pressures ranging from 2 to 10 atmospheres pressure, levels of air preheat to 427 C, combustor reference velocities from 10.0 to 20.0 m/sec, and an overall equivalence ratio of 0.3. Exit-plane and in-situ measurements are presented for HC, O2, CO2, CO, NOx. The exit-plane emissions of NOx correspond to levels reported from practical combustors and the in-situ data demonstrate the utility and potential for detailed flow-field measurements.

DTIC

Exhaust Emission; Contaminants; Jet Exhaust; Exhaust Gases; Gas Turbine Engines; Combustion Chambers; Engine Parts

08
AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also 05 Aircraft Design, Testing and Performance and 06 Avionics and Aircraft Instrumentation.

20010020314 Ohio State Univ., Columbus, OH USA

An Evaluation of an Analytical Simulation of an Airplane With Tailplane Icing by Comparison to Flight Data ***Final Report***

Hiltner, Dale W., Ohio State Univ., USA; December 2000; 44p; In English

Contract(s)/Grant(s): NAG3-2007; RTOP 711-21-23

Report No.(s): NASA/CR-2000-210561; NAS 1.26:210561; E-12513; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the assessment of an analytical tool developed as part of the NASA/FAA Tailplane Icing Program. The analytical tool is a specialized simulation program called TAILSM4 which was developed to model the effects of tailplane icing on the flight dynamics Twin Otter Icing Research Aircraft. This report compares the responses of the TAILSIM program directly to flight test data. The comparisons should be useful to potential users of TAILSIM. The comparisons show that the TAILSIM program qualitatively duplicates the flight test aircraft response during maneuvers with ice on the tailplane. TAILSIM is shown to be quantitatively "in the ballpark" in predicting when Ice Contaminated Tailplane Stall will occur during pushover and thrust transition maneuvers. As such, TAILSIM proved its usefulness to the flight test program by providing a general indication of the aircraft configuration and flight conditions of concern. The aircraft dynamics are shown to be modeled correctly by the equations of motion used in TAILSIM. However, the general accuracy of the TAILSIM responses is shown to be less than desired primarily due to inaccuracies in the aircraft database. The high sensitivity of the TAILSIM program responses to small changes in load factor command input is also shown to be a factor in the accuracy of the responses. A pilot model is shown to allow TAILSIM to produce more accurate responses and contribute significantly to the usefulness of the program. Suggestions to improve the accuracy of the TAILSIM responses are to further refine the database representation of the aircraft aerodynamics and tailplane flowfield and to explore a more realistic definition of the pilot model.
Author
Software Development Tools; Aircraft Icing; Horizontal Tail Surfaces; Flight Simulation; Research Aircraft; Aerodynamics

20010020355 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA
Nonlinear Flight Control Using Forebody Tangential Blowing ***Final Report, Jun. 1996-Dec. 1998***
Takahara, Yuji, Stanford Univ., USA; Rock, Stephen R., Stanford Univ., USA; Nov. 29, 2000; 128p; In English
Contract(s)/Grant(s): F49620-96-1-0248
Report No.(s): AD-A385768; AFRL-SR-BL-TR-01-0008; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy
Forebody Tangential Blowing (FTB) is a pneumatic device that modifies the vortical flow over the forebody of an aircraft operating at high angles of attack. Modified vortical flow in turn creates roll and yaw moments for control. Consequently, it provides a mechanism that could greatly expand the flight envelope of future aircraft systems. One major factor that currently limits the use of FTB as a control effector is that it produces highly nonlinear and uncertain forces. In this work we develop a technique that will yield for the first time robust control at small levels of blowing thus enabling a new level of efficiency in the use of FTB as a device for flight control at high angles of attack.
DTIC
Control Equipment; Tangential Blowing; Flight Control; Nonlinearity

09
RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see 03 Air Transportation and Safety. For astronautical facilities see 14 Ground Support Systems and Facilities (Space).

20010020212 China Aerodynamics Research and Development Center, China
A Cryogenic High-Reynolds-Number Transonic Wind Tunnel with Precooled and Restricted Flow
Ruikang, Pan, China Aerodynamics Research and Development Center, China; Acta Aerodynamica Sinica; 1984, No. 2, pp. 87-92; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
To realize the full range of Reynolds numbers for aircraft in model testing, various high-Reynolds-number transonic wind tunnels are being developed abroad. In this paper, a cryogenic high-Reynolds-number transonic wind tunnel with precooled and restricted flows is described. The principle of temperature reduction while air passes through a flow restrictor, which is also a regulator, is applied. Air from a compressor is first cooled down to 215 K, and then is admitted into the pressure vessels. During the wind tunnel operation, the regulating valve must be controlled, so that fluid pressure is 5atm and its temperature is 154 K. Under the various Mach number conditions, different temperatures and pressures may be used to achieve a 7 Reynolds number as high as 16.7 x 10(exp 7). In this paper, the cooling system of the wind tunnel, the tunnel operating principles and the 2.4m transonic wind tunnel layout are described in detail.
Author
High Reynolds Number; Cryogenic Wind Tunnels; Transonic Wind Tunnels; Design Analysis

20010020378 NASA Langley Research Center, Hampton, VA USA

Recent National Transonic Facility Test Process Improvements (Invited)

Kilgore, W. A., NASA Langley Research Center, USA; Balakrishna, S., NASA Langley Research Center, USA; Bobbitt, C. W., Jr., NASA Langley Research Center, USA; Adcock, J. B., NASA Langley Research Center, USA; [2001]; 16p; In English; 39th; Aerospace Sciences, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-0756; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes the results of two recent process improvements; drag feed-forward Mach number control and simultaneous force/moment and pressure testing, at the National Transonic Facility. These improvements have reduced the duration and cost of testing. The drag feedforward Mach number control reduces the Mach number settling time by using measured model drag in the Mach number control algorithm. Simultaneous force/moment and pressure testing allows simultaneous collection of force/moment and pressure data without sacrificing data quality thereby reducing the overall testing time. Both improvements can be implemented at any wind tunnel. Additionally the NTF is working to develop and implement continuous pitch as a testing option as an additional method to reduce costs and maintain data quality.

Author

Transonic Wind Tunnels; Wind Tunnel Tests; Aerodynamic Drag; Feedforward Control; Dynamic Control; Loads (Forces); Mach Number

20010020755 Army Engineer Waterways Experiment Station, Vicksburg, MS USA

Evaluation of Strategic Highway Research Program (SHRP) Products for Application to Airport Pavements ***Final Report***

Newman, J. K., Army Engineer Waterways Experiment Station, USA; Freeman, R. B., Army Engineer Waterways Experiment Station, USA; Oct. 2000; 250p; In English

Contract(s)/Grant(s): DTFA03-94-X-00010

Report No.(s): PB2001-102423; No Copyright; Avail: CASI; A03, Microfiche; A11, Hardcopy

The Strategic Highway Research Program (SHRP) was a $150 million 5-year research program targeted toward four areas: asphalt, concrete, highway operations, and pavement engineering. This work resulted in 128 products, each of which may be a device, procedure, specification, etc. Many of these products and other aspects of the SHRP research have application to airfield pavements, but these technologies must be evaluated on an individual basis to determine their usefulness. These reviews have been organized into fact sheets that provide a brief description of the product and an evaluation of whether the technology has application of Federal Aviation Administration (FAA) pavements and the technical issues involved in their use. The SHRP asphalt mixture design system (SUPERPAVE) has been evaluated in relation to current FAA asphalt mixture design. Asphalt mixture tests (repeated simple sheer at constant height, flexural beam fatigue, and thermal stress restrain specimen test), utilized during SHRP, revealed no significant differences in performance-related material properties between heavy-duty SHRP and heavy-duty FAA laboratory-prepared specimens. Recommendations on the adoption and/or revision of aspects of the SHRP asphalt technologies for use by the FFA are included.

NTIS

Pavements; Airports; Bending Fatigue; Thermal Stresses

20010020851 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Propulsion Systems Evaluation Facility

Weiss, Thomas, Naval Air Warfare Center, USA; [2000]; 3p; In English

Report No.(s): AD-A383487; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

The contents include: 1) Fuels and Lubricants; 2) Secondary Power; 3) Aircraft engines; and 4) Drive Systems.

CASI

Propulsion System Performance; Test Facilities

20010020938 General Accounting Office, Community and Economic Development Div., Washington, DC USA

Airport Financing: Annual Funding as Much as 3 Billion (Dollars) Less Than Planned Development. Statement of Gerald L. Dillingham, Associate Director, Transportation Issues, Resources, Community and Economic Development Division

Feb. 10, 1999; 22p; In English

Report No.(s): PB2001-102241; GAO/T-RCED-99-84; Copyright; Avail: National Technical Information Service (NTIS)

This document discusses airport funding issues. Today's testimony focuses on three question: (1) how much are airports spending on capital development and what are the source of these funds: (2) if current funding levels continue, how do they

compare with airports' plans for development: and (3) what effect will various proposals to increase or make better use of existing funding have on airports' ability to fulfill their capital development plans.
NTIS
Airports; Projects; Costs; Planning

20010020939 General Accounting Office, Washington, DC USA
Airport Financing: Smaller Airports Face Future Funding Shortfalls. Statement of Gerald L. Dillingham, Associate Director, Transportation Issues, Resources, Community and Economic Development Division
Feb. 22, 1999; 20p; In English
Report No.(s): PB2001-102240; GAO/T-RCED-99-96; Copyright; Avail: National Technical Information Service (NTIS)
We are here today to discuss airport funding issues, especially as they apply to smaller airports. For our discussion, small airports include all but the 71 largest airports in the national airport system and range in size from small hub airports like Wichita, Kansas', Mid-Continent Airport to small general aviation airports with only a few aircraft based at them.
NTIS
Airports; Costs; Urban Development; Airport Planning; Transportation

20010021112 NASA Langley Research Center, Hampton, VA USA
Langley Research Center's Unitary Plan Wind Tunnel: Testing Capabilities and Recent Modernization Activities
Micol, John R., NASA Langley Research Center, USA; [2001]; 28p; In English; 39th; Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2001-0456; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche
Description, capabilities, initiatives, and utilization of the NASA Langley Research Center's Unitary Plan Wind Tunnel are presented. A brief overview of the facility's operational capabilities and testing techniques is provided. A recent Construction of Facilities (CoF) project to improve facility productivity and efficiency through facility automation has been completed and is discussed. Several new and maturing thrusts are underway that include systematic efforts to provide credible assessment for data quality, modifications to the new automation control system for increased compatibility with the Modern Design of Experiments (MDOE) testing methodology, and process improvements for better test coordination, planning, and execution.
Author
Wind Tunnel Tests; Supersonic Wind Tunnels; Technology Utilization

20010021115 Logistics Management Inst., McLean, VA USA
Civil Tiltrotor Feasibility Study for the New York and Washington Terminal Areas *Final Report*
Stouffer, Virginia, Logistics Management Inst., USA; Johnson, Jesse, Logistics Management Inst., USA; Gribko, Joana, Logistics Management Inst., USA; January 2001; 86p; In English
Contract(s)/Grant(s): NAS2-14361; RTOP 522-99-11-01
Report No.(s): NASA/CR-2001-210659; LMI-NS904S2; NAS 1.26:210659; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
NASA tasked LMI to assess the potential contributions of a yet-undeveloped Civil Tiltrotor aircraft (CTR) in improving capacity in the National Airspace System in all weather conditions. The CTRs studied have assumed operating parameters beyond current CTR capabilities. LMI analyzed CTRs three ways: in fast-time terminal area modeling simulations of New York and Washington to determine delay and throughput impacts; in the Integrated Noise Model, to determine local environmental impact; and with an economic model, to determine the price viability of a CTR. The fast-time models encompassed a 250 nmi range and included traffic interactions from local airports. Both the fast-time simulation and the noise model assessed impacts from traffic levels projected for 1999, 2007, and 2017. Results: CTRs can reduce terminal area delays due to concrete congestion in all time frames. The maximum effect, the ratio of CTRs to jets and turboprop aircraft at a subject airport should be optimized. The economic model considered US traffic only and forecasted CTR sales beginning in 2010.
Author
Feasibility Analysis; Economics; Environmental Surveys; Models; Tilt Rotor Aircraft; Turboprop Aircraft

20010021258 Helsinki Univ. of Technology, Espoo, Finland
Low Temperature Laboratory, Helsinki University of Technology *Annual Report, 1998*
1999; 80p; In English
Report No.(s): PB2000-102621; No Copyright; Avail: National Technical Information Service (NTIS)

Graduate schools and Centers of Excellence are relatively new concept in the science policy of Academy of Finland. Low Temperature Laboratory (LTL) is one of the members of two graduate schools. All research projects of LTL made steady progress in 1998. The research projects are: Nano-physics research; Nuclear magnetism in Rhodium; Topological objects in quantum fluids; Interfaces in quantum systems; Theory of superfluid He-3; Cern-collaborations; Compass; RD-39; Neuromagnetic research.
Derived from text
Helium Isotopes; Magnetic Properties; Superfluidity; Biomagnetism; Research Facilities

20010021287 National Inst. of Standards and Technology, Office of Law Enforcement Standards, Gaithersburg, MD USA
User's Manual for Lidar Target Simulator
Worthey, J. A.; March 2000; 58p; In English
Contract(s)/Grant(s): DTNH22-98-X-05046
Report No.(s): PB2000-100841; NISTIR-6418; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This operator's manual is for a target simulator for speed-measuring lidars, and for the computer program VS, which is a key part of the simulator. This is the simulator referred to in DOT HS 808 539, Model minimum performance specifications for lidar speed measurement devices, published by the National Highway Traffic Safety Administration, February 1997. The simulator works with lidar units that have a fixed pulse repetition rate, or PRR. The user selected the speed and initial range of the simulated target vehicle. These settings, together with the PRR and the speed of light in air are used to compute a sequence of delay times, modeling the echoes from a vehicle moving at constant speed. The lidar under test should respond to the sequence of delays as it would to a real moving target, and its reading should agree with the simulated speed. The software guides the user through the description of the unit under test, the PRR measurement, the test parameters, and the running of the simulation. Readers are able to experiment with the program before building a complete simulator.
NTIS
Optical Radar; Target Simulators; User Manuals (Computer Programs); Velocity Measurement; Software Engineering

20010021370 Texas A&M Univ., Texas Transportation Inst., College Station, TX USA
Evaluation of the Relationship of Service Levels, Functional Categories, and Design Standards for General Aviation Airports, *Sep. 1998 - Aug. 1999*
Borowiec, J. D.; Dresser, G. B.; Aug. 1999; 80p; In English
Contract(s)/Grant(s): Proj. 7-1988
Report No.(s): PB2001-102676; Copyright; Avail: National Technical Information Service (NTIS)
This study examines certain airport design standards in an effort to understand the rationale behind their development. Researchers studied the standards to identify potential standards for relaxing. The focus is on smaller, less active airports where revised standards may make certain needs and projects affordable without compromising safety and operational capabilities. Accident records were reviewed to determine what role, if any, the accidents were caused by insufficient design standards. Existing standards were reviewed and revised standards were recommended based on the role and functional category of particular airports. Finally, the impacts of these revised standards for smaller, less active airports were examined by reviewing the potential for cost saving on projects included in two separate capital improvement programs.
NTIS
Airports; General Aviation Aircraft; Structural Design; Design Analysis

20010021554 Defence Science and Technology Organisation, Melbourne Australia
Transonic Wind Tunnel Tests on Tonic Mk 5-2: Exercise Yakkata Operational Vehicle
Link, Yoel Y.; Nov. 2000; 113p; In English
Report No.(s): AD-A385596; DSTO-TR-1078; DODA-AR-011-654; Copyright; Avail: Issuing Activity
A test programme on a one-third scale model of a Tonic Mk 5-2 towed target has been carried out in the AMRL 0.81 m x 0.53 m Transonic Wind Tunnel. This detailed investigation showed that the modifications made in converting Tonic Mk 5-1 to Tonic Mk 5-2 did not have any significant adverse effect on the aerodynamic characteristics. This report describes the Tonic Mk 5-2 configuration the wind tunnel tests, and an extensive aerodynamic comparison of the two Tonic configurations.
DTIC
Wind Tunnel Tests; Scale Models

20010021555 Defence Science and Technology Organisation, Melbourne Australia

Software Function Summaries for the Low Speed Wind Tunnel Data Acquisition System

Edwards, Craig D.; Holland, Owen F.; Lam, Stephen S.; Leung, Sunny Y.; Link, Yoel Y.; Nov. 2000; 223p; In English

Report No.(s): AD-A385598; DSTO-TN-0321; DODA-AR-011-643; Copyright; Avail: Issuing Activity

The data acquisition system in the Low Speed Wind Tunnel at the Aeronautical and Maritime Research Laboratory was recently upgraded. Several software packages were developed using C, X/Motif, and OpenGL programming languages and libraries. The software provides wind tunnel operators with graphical user interfaces from which test data can be easily monitored, acquired and processed. Descriptions of all software source code functions have been compiled and included as Appendices in this document. These function summaries have also been published on the Defence Science and Technology Organization Internet for easy reference for future software development.

DTIC

Data Acquisition; Computer Programming; Applications Programs (Computers); Software Engineering; Research and Development; Wind Tunnel Tests

12
ASTRONAUTICS (GENERAL)

Includes general research topics related to space flight and manned and unmanned space vehicles, platforms or objects launched into, or assembled in, outer space; and related components and equipment. Also includes manufacturing and maintenance of such vehicles or platforms. For specific topics in astronautics see categories 13 through 20. For extraterrestrial exploration, see 91 Lunar and Planetary Science and Exploration.

20010020064 NASA Goddard Space Flight Center, Greenbelt, MD USA

Advance Formation Flying Concepts

Wiscombe, Warren, NASA Goddard Space Flight Center, USA; [2000]; 1p; In English; NIAC Workshop, 7-9 Nov. 2000, Atlanta, GA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Some of the suggested formation flying missions for the next 10 years will be presented. Most of these are in the space science area. The reasons for the lesser interest from Earth scientists will be listed and critiqued. The needs for space infrastructure to service formations of low-Earth-orbit satellite will be brought out, including possible uses of the International Space Station.

Author

Satellite Constellations; Stationkeeping

20010020400 NASA, Washington, DC USA

Humans to Mars: Fifty Years of Mission Planning, 1950-2000

Portree, David S. F., NASA, USA; February 2001; 164p; In English

Report No.(s): NASA/SP-2001-4521; NAS 1.21:4521; LC-00-062218; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Contents of this document include: On the Grand Scale; Earliest NASA Concepts; EMPIRE and After; A Hostile Environment; Apogee; Viking and the Resources of Mars; The Case for Mars; Challengers; Space Exploration Initiative; and Design Reference Mission.

CASI

Manned Mars Missions; Space Exploration; Mission Planning

20010021293 Technical Research Centre of Finland, Espoo, Finland

Survey on Space Applications of Finnish Micro/Nano Technologies

Graeffe, Jussi, Technical Research Centre of Finland, Finland; Saari, Heikki, Technical Research Centre of Finland, Finland; Salminen, Arto, Technical Research Centre of Finland, Finland; December 1999; ISSN 1235-0605; 52p; In English

Report No.(s): PB2000-106136; VTT/RN-2006; VTT-TIED-2006; ISBN 951-38-5622-4; Copyright; Avail: National Technical Information Service (NTIS)

This report deals with Finnish involvement in MNT projects and the relevance of Finnish MNT expertise from the space technology perspective. At least nine Finnish companies can be identified having strong focus on MNT or related technologies. Most of them have active collaboration with various research institutes that develop new technologies. Practically every technical university in Finland has current MNT research activities. From technological point of views, the most promising applications are various microaccelerometers and versatile optical applications, such as imaging microbolometers, micromechanical mirrors

and grid filters. X-ray detection with bolometers utilizing SQUID based readout electronics will have a major focus. Also packaging technology and specialized software need to be developed in association with new applications. Various robotic applications are being developed as a result of these efforts.
NTIS
Nanotechnology; Micromechanics; Technology Utilization; Measuring Instruments

20010021341 NASA Marshall Space Flight Center, Huntsville, AL USA
Laser Solutions for Reducing the Environmental Risks Associated with Orbital Debris and Near Earth Objects
Campbell, Jonathan W., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 52nd; International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France
Contract(s)/Grant(s): CDDF Proj. 2000-11; No Copyright; Avail: Issuing Activity; Abstract Only

Increasing activity in space is gradually increasing the amount of orbital debris in low earth orbit. As the debris increases, the environmental risk (hypervelocity collisions) associated with spaceflight also increases. Debris larger than 10 cm can typically be detected and tracked sufficiently to allow risk avoidance to be achieved by maneuvering to safe distances. Risk reduction for objects smaller than I cm may be accomplished through shielding. However, intermediate sized debris remains a problem. A convenient risk reduction solution has been identified using modem laser technology. In this approach, a relatively low energy laser facility operating near e equator may significantly reduce the amount of intermediate sized debris (1 - 10 cm) in a few years of operation. A sufficiently intense laser pulse arriving at a debris objects surface will ablate a micro-thin layer of material. As this hot gas rapidly expands away from the object, a small change in momentum is imparted. The momentum change for one pulse is insignificant. However, since the laser can provide 10-1000 pulses per second over several minutes, the cumulative effect is substantive. The object's perigee may be lowered in this manner into atmosphere where it will be vaporized. This same technique may be employed on a larger scale for risk reduction in asteroids, meteoroids, and comets colliding with the Earth at hypervelocities.
Author
Pulsed Lasers; Ablation; Collisions; Laser Applications; Maneuvers; Shielding; Space Debris

20010021656 Boston Coll., Inst. for Scientific Research, Boston, MA USA
Midcourse Space Experiment (MSX): Planned Observations of MWIR BTH and LATH Backgrounds
Gardiner, Harold A. B., Phillips Lab., USA; ONeil, Robert R., Phillips Lab., USA; Grieder, William, Grieder Research Engineering, USA; Hegblom, Richard, Boston Coll., USA; Humphrey, Charles, Visidyne, Inc., USA; Stair, A. T., Visidyne, Inc., USA; Gallery, William O., Atmospheric and Environmental Research, Inc., USA; Sears, Robert, Jamieson Science and Engineering, Inc., USA; Proceedings of the SPIE International Symposium on Optical Engineering in Aerospace Sensing; Nov. 04, 1998; 13p; In English; Optical Engineering in Aerospace Sensing, 4-8 Apr. 1994, Orlando, FL, USA; Sponsored by International Society for Optical Engineering, Unknown
Contract(s)/Grant(s): F19628-91-K-0001
Report No.(s): AD-A384558; AFRL-VS-HA-TR-98-0115; Copyright; Avail: Defense Technical Information Center (DTIC)

Two Midcourse Space Experiment (MSX) experiments are designed to obtain data on terrestrial (below the horizon, BTH) and low earthlimb (low above the horizon, LATH, below 40 km tangent height) backgrounds as seen from the MSX satellite by the Spirit III cryogenically cooled radiometer and UVISI imagers. The radiometer will provide data in two mid-wave infrared (MWIR) bands with a spatial resolution of 90 micro-radians and a temporal resolution of 13.9 msec to characterize the small scale structure of the backgrounds and their global distribution. Other instruments aboard the MSX Spirit Interferometer, Space Based Visible Surveillance Camera and the Spectographic Imagers (SPIMS) payload will provide supporting spectral and spatial imagery data for correlating phenomenological behavior in the ultraviolet, visible and infrared regions of the spectrum. The 18-month duration of the cryogen will afford many opportunities to sample the backgrounds during all season, cloud and terrain conditions, day, night, and terminator scenes and a variety of solar scattering angles. Automated data processing will provide rapid reductions of the data and generate products characterizing the scene content and statistical distributions of radiance as well as indices for cataloging the data.
Author
Spaceborne Experiments; Spatial Resolution; Statistical Distributions; Infrared Radiation; Radiance; Radiometers

20010021660 Boston Coll., Inst. for Scientific Research, Newton, MA USA
Midcourse Space Experiment (MSX): Planned Observations of Infrared Earthlimb and Terrestrial Backgrounds
ONeil, Robert R., Phillips Lab., USA; Gardiner, Harold A. B., Phillips Lab., USA; Gibson, James, Phillips Lab., USA; Humphrey, Charles, Visidyne, Inc., USA; Hegblom, Richard, Boston Coll., USA; Fraser, Mark E., Physical Sciences, Inc., USA; Kendra,

Michael, Radex, Inc., USA; Proceedings of the 34th AIAA Aerospace Sciences Meeting and Exhibit; Nov. 04, 1998; 11p; In English; 34th; Aerospace Sciences, 15-18 Jan. 1996, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AD-A384589; AIAA Paper 96-0222; AFRL-VS-HA-TR-98-0116; Copyright Waived; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Midcourse Space Experiment (MSX) is a Ballistic Missile Defense measurements program to characterize target and background signatures using an extremely instrumented space-based sensor. A major objective of the program is to obtain global data of the earthlimb and terrestrial backgrounds simultaneously the infrared (2.6 to 28 microns) and shorter wave (0.11 to 0.9 microns) spectral regions. The measurements support the development of surveillance systems and the validation and extension of background models. Of particular importance is the characterization of the spatial-temporal structure and the global distribution of mean radiometric levels and spectral content of both atmospheric and terrestrial backgrounds. Planned observations and investigations include the dynamic backgrounds associated with aurora and geomagnetically perturbed conditions, mesospheric and noctilucent clouds, wave phenomena, scattered and thermal emissions from clouds and terrain, stratospheric warnings and other sources.Experiments are planned to collect data as a function of: latitude, season, diurnal conditions, magnetic activity and altitude over a period of 15 months for the infrared (cryogen lifetime) and 5 years for the visible and ultraviolet sensors. Coordinated experiments are planned with various ground sites, and in conjunction with the Defense Meteorological Satellite Program (DMSP). The data will be used to quantify operational constraints imposed in space-based systems as well as to provide insight into global environmental issues such as stratospheric ozone depletion and climate change. Automated data processing will support rapid assimilation and review of the experimental results, and the accumulation of summary data products and statistics.
Author
Spaceborne Experiments; Ballistic Missiles; Infrared Radiation; Cryogenics; Targets; Thermal Emission; Signatures

13
ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

20010021231 Colorado Univ., Dept. of Aerospace Engineering Sciences, Boulder, CO USA
Real Time, Autonomous, Precise Orbit Determination Using the Global Positioning System
Goldstein, David B.; Dec. 06, 2000; 210p; In English
Report No.(s): AD-A385449; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

In an effort to estimate precise satellite ephemeris in real-time on board a satellite, the Goddard Space Flight Center (GSFC) created the GPS Enhanced Orbit Determination Experiment (GEODE) flight navigation software. This dissertation offers alternative methods and improvements to GEODE to increase on board autonomy and real-time total position accuracy and precision without increasing computational burden. First, GEODE is modified to include a Gravity Acceleration Approximation Function (GAAF) to replace the traditional spherical harmonic representation of the gravity field. Next, an ionospheric correction method called Differenced Range Versus Integrated Doppler (DRVID) is applied to correct for ionospheric errors in the GPS measurements used in GEODE. Then, Dynamic Model Compensation (DMC) is added to estimate unmodeled and/or mismodeled forces in the dynamic model and to provide an alternative process noise variance-covariance formulation. Finally, a Genetic Algorithm (GA) is implemented in the form of Genetic Model Compensation (GMC) to optimize DMC forcing noise parameters. Application of GAAF, DRVID an(i DMC improved GEODE's position estimates by 28.3% when applied to GPS/MET data collected in the presence of Selective Availability (SA), 17.5% when SA is removed from the GPS/MET data and 10.8% on SA free TOPEX data. Position estimates with RSS errors below 1 meter are now achieved using SA free TOPEX data. DRVID causes an increase in computational burden while GAAF and DMC reduce computational burden. The net effect of applying GAAF, DRVID and DMC is an improvement in GEODE's accuracy/precision without an increase in computational burden.
DTIC
Global Positioning System; Applications Programs (Computers); Orbit Determination; Real Time Operation; Autonomy; Genetic Algorithms; Navigation; Satellite Tracking

15
LAUNCH VEHICLES AND LAUNCH OPERATIONS

Includes all classes of launch vehicles, launch/space vehicle systems, and boosters; and launch operations. For related information see also 18 Spacecraft Design, Testing, and Performance; and 20 Spacecraft Propulsion and Power.

20010020379 NASA Marshall Space Flight Center, Huntsville, AL USA
Launcher Systems Development Cost: Behavior, Uncertainty, Influences, Barriers and Strategies for Reduction
Shaw, Eric J., NASA Marshall Space Flight Center, USA; Oct. 01, 2001; 2p; In English; 52nd; International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

This paper will report on the activities of the IAA Launcher Systems Economics Working Group in preparations for its Launcher Systems Development Cost Behavior Study. The Study goals include: improve launcher system and other space system parametric cost analysis accuracy; improve launcher system and other space system cost analysis credibility; and provide launcher system and technology development program managers and other decisionmakers with useful information on development cost impacts of their decisions. The Working Group plans to explore at least the following five areas in the Study: define and explain development cost behavior terms and concepts for use in the Study; identify and quantify sources of development cost and cost estimating uncertainty; identify and quantify significant influences on development cost behavior; identify common barriers to development cost understanding and reduction; and recommend practical, realistic strategies to accomplish reductions in launcher system development cost.
Derived from text
Cost Analysis; Cost Estimates; Cost Reduction; Decision Making; Launchers; Life (Durability); Spacecraft Design

16
SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also 03 Air Transportation and Safety and 15 Launch Vehicles and Launch Vehicles, and 18 Spacecraft Design, Testing and Performance. For space suits, see 54 Man/System Technology and Life Support.

20010019849 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-49 Endeavour Mission Highlights Resource Tape, Part 2 of 2
Nov. 24, 1997; In English; Videotape: 44 min. 17 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000180489; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Footage shows the in-flight and landing activities of the STS-49 Endeavour crew, Commander Daniel C. Brandenstein, Pilot Kevin P. Chilton, and Mission Specialists Pierre J. Thuot, Kathryn C. Thornton, Richard J. Hieb, Thomas D. Akers, and Bruce E. Melnick. Thornton and Akers are seen during their spacewalks as they begin assembly on the Space Station Freedom in the payload bay of Endeavour. The crew is shown during de-orbit preparations (such as suiting up and closing the payload bay doors) and Endeavour is seen landing. Shots of Earth from the Orbiter show the southern Atlantic Ocean, southern African continent, and Indian Ocean. The moon is seen above Earth's atmosphere and a storm is seen on the night side as lighting illuminates the clouds.
CASI
Crew Procedures (Inflight); Spacecraft Landing; Assembling

20010019851 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-49 Crew Press Conference, Part 1 of 2
Apr. 08, 1992; In English; Videotape: 62 min. 25 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2000152224; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

The crew of STS-49, Commander Daniel C. Brandenstein, Pilot Kevin P. Chilton, Mission Specialists Pierre J. Thuot, Kathryn C. Thornton, Richard J. Hieb, Thomas D. Akers, and Bruce E. Melnick each give an overview of his or her part in the mission. Questions from the press are answered. This is part one of two videos.
CASI
Endeavour (Orbiter); Prelaunch Summaries; Crew Procedures (Preflight)

20010019852 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-53 Countdown Status Briefing
Nov. 30, 1992; In English; Videotape: 18 min. 1 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001023157; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

George Diller, NASA Public Affairs, introduces Mike Leinbach, Shuttle Test Director, and Ed Prisella, Shuttle Weather Officer, USAF. They give a summary of the countdown for the launch of STS-53 Discovery and information on the weather for the launch time. They then answer questions from the press.

CASI
Countdown; Weather Forecasting; Prelaunch Summaries

20010019855 NASA Kennedy Space Center, Cocoa Beach, FL USA
STS-52 Crew Briefing
Sep. 24, 1992; In English; Videotape: 44 min. 4 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001017547; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Commander James B. Wetherbee introduces the crew of STS-52 Columbia, Pilot Michael A. Baker, and Mission Specialists Charles L. Veach, William M. Shepherd, Tamara E. Jernigan, and Steven G. MacLean, in a preflight conference. Each crew member gives an overview of the mission objectives, experiments, payload (LAGEOS-II), and his/her role in the mission. They then answer questions from the press.

CASI
Prelaunch Summaries; Spaceborne Experiments; Lageos (Satellite); Crew Procedures (Inflight)

20010019895 NASA Johnson Space Center, Houston, TX USA
STS-98 Crew Activity Report/Flight Day 4 Highlights
Feb. 11, 2001; In English; Videotape: 27 min. 37 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001026557; BRF-1426D; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this fourth day of the STS-98 mission, Mission Specialists Bob Curbeam and Tom Jones are seen suiting up in preparation for their upcoming spacewalks and during the spacewalks. The Destiny Laboratory Module is shown as it is lifted out of the payload bay of Atlantis and is attached to the International Space Station (ISS) by Jones.

CASI
International Space Station; Extravehicular Activity; Installing; Destiny Laboratory Module

20010019898 NASA Johnson Space Center, Houston, TX USA
STS-98 Crew Activity Report/Flight Day 5 Highlights
Feb. 12, 2001; In English; Videotape: 13 min. 11 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001024844; BRF-1426-E; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

On this fifth day of the STS-98 mission, the crew of Atlantis (Commander Kenneth D. Cockrell, Pilot Mark L. Polansky, and Mission Specialists Robert L. Curbeam, Thomas D. Jones, and Marsha S. Ivins), the Expedition 1 crew (William M. Shepherd, Yuri P. Gidzenko, and Sergei K. Krikalev), and the Expedition 2 crew (James S. Voss, Susan J. Helms, and Yuriy V. Usachev), are seen opening and entering the Destiny Laboratory Module.

CASI
International Space Station; Destiny Laboratory Module

20010019899 NASA Johnson Space Center, Houston, TX USA
STS-98 Crew Activity Report/Flight Day 2 Highlights
Feb. 09, 2001; In English; Videotape: 24 min. 59 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001024840; BRF-1426B; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this second day of the STS-98 mission, Atlantis continues to pursue the International Space Station (ISS). The unmanned Progress resupply spacecraft, loaded with trash, is sent into an orbit that will eventually drop the spacecraft into Earth's atmo-

sphere, which will burn it up. Commander Cockrell and Mission Specialist Tom Jones are seen answering questions about the Destiny Laboratory Module and the mission.
CASI
Atlantis (Orbiter); Crew Procedures (Inflight); Destiny Laboratory Module

20010020029 NASA Johnson Space Center, Houston, TX USA
STS-98 Crew Activity Report/Flight Day 10 Highlights
Feb. 17, 2001; In English; Videotape: 15 min. 12 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001028020; BRF-1426J; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

On this tenth day of the STS-98 mission, Atlantis undocks from the International Space Station (ISS). Commander Kenneth D. Cockrell, Pilot Mark L. Polansky, and Mission Specialists Robert L. Curbeam, Thomas D. Jones, and Marsha S. Ivins answer questions about the mission.
CASI
Spacecraft Docking; Crew Procedures (Inflight); International Space Station; Atlantis (Orbiter)

20010020030 NASA Johnson Space Center, Houston, TX USA
STS-98 Crew Activity Report/Flight Day 11 Highlights
Feb. 18, 2001; In English; Videotape: 15 min. 37 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001028019; BRF-1426K; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this eleventh day of the STS-98 mission, Commander Kenneth D. Cockrell, Pilot Mark L. Polansky, and Mission Specialists Robert L. Curbeam, Thomas D. Jones, and Marsha S. Ivins answer questions about their mission. Footage shows the undocking of Atlantis from the International Space Station (ISS), which took place the day before. The coastline of South America along the Andes Mountains is seen from space.
CASI
Crew Procedures (Inflight); Spacecraft Docking

20010020031 NASA Johnson Space Center, Houston, TX USA
STS-98 Crew Activity Report/Flight Day 9 Highlights
Feb. 16, 2001; In English; Videotape: 19 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001028017; BRF-1426I; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this ninth day of the STS-98 mission, Expedition 1 crewmember Bill Shepherd gives a tour of the Density Laboratory Module, describing the equipment and functions. Mission Specialists Bob Curbeam and Tom Jones answer questions about their spacewalks and the Destiny Module. The rest of the Atlantis crew (Commander Kenneth D. Cockrell, Pilot Mark L. Polansky, and Mission Specialist Marsha S. Ivins) and the Expedition 1 crew (William M. Shepherd, Yuri P. Gidzenko, and Sergei K. Krikalev) join Curbeam and Jones to answer questions about the mission.
CASI
Crew Procedures (Inflight); Destiny Laboratory Module; Extravehicular Activity

20010020032 NASA Johnson Space Center, Houston, TX USA
STS-98 Crew Activity Report/Flight Day 8 Highlights
Feb. 15, 2001; In English; Videotape: 25 min. 29 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001028016; BRF-1426H; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this eighth day of the STS-98 mission, Mission Specialists Tom Jones and Bob Curbeam perform their first spacewalks of the mission. They are seen removing and installing the S-Band Antenna from the payload bay of Atlantis to the International Space Station (ISS). Jones and Curbeam commemorate the 100th spacewalk and say a few words about the accomplishments of spacewalkers in the past.
CASI
Extravehicular Activity; Crew Procedures (Inflight); International Space Station

20010020281 NASA Johnson Space Center, Houston, TX USA

STS-97 Mission Highlights Resource Tape, Part 1

Feb. 20, 2001; In English; Videotape: 46 min. 57 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001028105; JSC-1858; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Various clips give an overview of the STS-97 Endeavour mission. Footage includes Endeavour on the launch pad, the crew of STS-97 (Commander Brent W. Jett, Pilot Michael J. Bloomfield, and Mission Specialists Joseph R. Tanner, Carlos I. Noriega, and Marc Garneau) suiting up, replays of the nighttime launch, Launch Control Center at Kenendy Space Center during countdown, and the activities of flight days one through three. The activities of flight days four through six can be seen on 'STS-97 Mission Highlights Resource Tape, Part 2 of 3' (document ID 20010020282). The activities of flight days seven through eleven and Endeavour's landing can be found on 'STS-97 Mission Highlights Resource Tape, Part 3 of 3' (document ID 20010020283).

CASI

Endeavour (Orbiter); Countdown; Spacecraft Launching; Crew Procedures (Preflight); Crew Procedures (Inflight)

20010020282 NASA Johnson Space Center, Houston, TX USA

STS-97 Mission Highlights Resource Tape, Part 2

Feb. 20, 2001; In English; Videotape: 58 min. 31 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001028104; JSC-1858; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

A continuation of 'STS-97 Mission Highlights Resource Tape, Part 1 of 3' (document ID 20010020281), the activities of flight days four through six are seen. Footage includes the spacewalks performed by Noriega and Tanner, the deployment of the Solar Array Blanket Box (SABB), various shots of Endeavour's payload bay and the International Space Station (ISS), and the deployment of the solar radiators on the ISS. Flight days seven through eleven and Endeavour's landing are shown in 'STS-97 Mission Highlights Resource Tape, Part 3 of 3' (document ID 20010020283).

CASI

Endeavour (Orbiter); International Space Station; Deployment; Crew Procedures (Inflight); Extravehicular Activity

20010020283 NASA Johnson Space Center, Houston, TX USA

STS-97 Mission Highlights Resource Tape, Part 3

Feb. 20, 2001; In English; Videotape: 58 min. 54 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001028103; JSC-1858; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

A continuation of 'STS-97 Mission Highlights Resource Tape, Part 1 of 3' (document ID 20010020281) and 'STS-97 Mission Highlights Resource Tape, Part 2 of 3' (document ID 20010020282), the activities of flight days seven through eleven are seen. Footage includes the crew discussing repair procedures for the Solar Array Wing (SAW) with mission managers, shots of the shuttle's payload bay, the International Space Station (ISS) with Earth in the background, the Node Micrometeoroid/Orbital Debris Shield removal, the spacewalks performed by Mission Specialists Joseph Tanner and Carlos Noriega, the undocking of Endeavour and ISS, the Orbital Maneuvering System (OMS) firing, the payload bay doors closing, and the landing sequence of Endeavour. The Aurora Borealis and a night view of the French Rivera are seen from space.

CASI

International Space Station; Crew Procedures (Inflight); Extravehicular Activity; Spacecraft Landing; Spacecraft Docking

20010020287 NASA Johnson Space Center, Houston, TX USA

STS-98 Crew Activity Report/Flight Day 7 Highlights

Feb. 14, 2001; In English; Videotape: 12 min. 23 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001028078; BRF-1426G; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

On this seventh day of the STS-98 mission, Pilot Mark L. Polansky and Mission Specialists Tom Jones, Bob Curbeam, and Marsha Ivins are seen answering questions about the International Space Station (ISS), the mission's spacewalks, and the Destiny Laboratory Module. Footage shows external views of the Atlantis Orbiter and ISS with a backdrop of Earth.

CASI

Atlantis (Orbiter); International Space Station; Extravehicular Activity; Crew Procedures (Inflight); Destiny Laboratory Module

20010020288 NASA Johnson Space Center, Houston, TX USA
STS-98 Crew Activity Report/Flight Day 6 Highlights
Feb. 13, 2001; In English; Videotape: 18 min. 36 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001028077; BRF-1426F; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this sixth day of the STS-98 mission, Mission Specialists Bob Curbeam and Tom Jones are seen finishing the installation of the Destiny Laboratory onto the International Space Station (ISS) during their spacewalks.
CASI
International Space Station; Installing; Destiny Laboratory Module; Extravehicular Activity; Crew Procedures (Inflight)

20010020384 NASA Marshall Space Flight Center, Huntsville, AL USA
Focus of NASA's Spaceliner 100 Investment Area
Hueter, Uwe, NASA Marshall Space Flight Center, USA; [2000]; 20p; In English; Airbreathing Propulsion, 14-15 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This presentation discuss the goals and objectives of the SL100 Technology Focus. Some of the Technology objectives were to: increase system performance margin; drive down operations costs; drive down manufacturing and production costs; and drive down development test and evaluation costs.
CASI
Cost Reduction; Launch Costs; Operating Costs; Production Costs; Manufacturing; Launch Vehicles

20010021196 NASA Kennedy Space Center, Cocoa Beach, FL USA
The Lighthouse that Never Fails
Jun. 01, 1958; In English; Videotape: 3 min. 58 sec. playing time, black and white, with sound
Report No.(s): NONP-NASA-VT-2001023129; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

A fictional piece of work, the film shows a man taken into space when the lighthouse that he is in launches.
CASI
Lighting Equipment; Launching

20010021485 NASA Johnson Space Center, Houston, TX USA
STS-102 Crew Training
Feb. 27, 2001; In English; Videotape: 37 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001029048; JSC1870; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Footage shows the crew of STS-102, Commander James D. Wetherbee, Pilot James M. Kelly, and Mission Specialists Andrew S. W. Thomas and Paul Richards, during various parts of their training. Scenes include: (1) neutral buoyancy lab training; (2) undocking/fly-around training in the GNS (Navigation Simulator); (3) crew equipment interface test; (4) Remote Manipulator System (RMS) training in the GNS; and (5) docking training in the GNS.
CASI
Astronaut Training; Crew Procedures (Preflight); Remote Manipulator System; Simulation

20010021732 Science Applications International Corp., Center for Applied Computational Sciences, McLean, VA USA
CFD Applications in Support of the Space Shuttle Risk Assessment
Baum, Joseph D., Science Applications International Corp., USA; Mestreau, Eric, Science Applications International Corp., USA; Luo, Hong, Science Applications International Corp., USA; Sharov, Dmitri, Science Applications International Corp., USA; Fragola, Joseph, Science Applications International Corp., USA; Loehner, Rainald, George Mason Univ., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 47-54; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The paper describes a numerical study of a potential accident scenario of the space shuttle, operating at the same flight conditions as flight 51L, the Challenger accident. The interest in performing this simulation is derived by evidence that indicates that the event itself did not exert large enough blast loading on the shuttle to break it apart. Rather, the quasi-steady aerodynamic loading on the damaged, unbalance vehicle caused the break-up. Despite the enormous explosive potential of the shuttle total fuel load (both liquid and solid), the post accident explosives working group estimated the maximum energy involvement to be equivalent to about five hundreds of pounds of TNT. This understanding motivated the simulation described here. to err on the conservative

side, we modeled the event as an explosion, and used the maximum energy estimate. We modeled the transient detonation of a 500 lbs spherical charge of TNT, placed at the main engine, and the resulting blast wave propagation about the complete stack. Tracking of peak pressures and impulses at hundreds of locations on the vehicle surface indicate that the blast load was insufficient to break the vehicle, hence demonstrating likely crew survivability through such an event.
Author
Assessments; Computational Fluid Dynamics; Flight Conditions; Risk; Space Shuttles

18
SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see 54 Man/System Technology and Life Support. For related information, see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.

20010020063 NASA Goddard Space Flight Center, Greenbelt, MD USA
TT and C - First TDRSS, Then Commercial GEO and Big LEO and Now through LEO
Morgan, Dwayne, NASA Goddard Space Flight Center, USA; Bull, Barton, NASA Goddard Space Flight Center, USA; Grant, Charles, Computer Sciences Corp., USA; Streich, Ronald, Computer Sciences Corp., USA; [2001]; 1p; In English; 4th; Reducing the Cost of Spacecraft, Ground Systems and Operations, 24-27 Apr. 2001, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The advent of low earth orbit (LEO) commercial communications satellites provides an opportunity to dramatically reduce Telemetry Tracking and Control (TT&C) costs of launch vehicles and Unpiloted Aerial Vehicles (UAVs) by reducing or eliminating ground infrastructure. Personnel from the Goddard Space Flight Center Wallops Flight Facility (GSFC/WFF) in Virginia have successfully used commercial GEO & Big LEO communications satellites for Long Duration Balloon flight TT&C. In addition, TDRSS capability for these balloons has been developed by WFF for the Ultra Long Duration Balloons with the first test flight launch in January 2001 for one global circumnavigation at 120,000 feet altitude launched from Alice Springs. Australia. Numerous other low cost applications can new utilize the commercial LEO satellites for TT&C. The Flight Modern became a GSFC/WFF Advanced Range Technology Initiative (ARTI) in an effort to streamline TT&C capability to the user community at low cost. Phase I ground tests of The Flight Modem verified downlink communications quality of service and measured transmission latencies. These tests were completed last year, Phase II consisting of aircraft flight tests provide much of the data presented in this paper. Phase III of the Flight Modern baseline test program is a demonstration of the ruggedized version of the WFF Flight Modem flown on one sounding rocket launched from Sweden. Flights of opportunity have been and are being actively pursued with other centers, ranges and users at universities. The WFF goal is to reduce TT&C costs by providing a low cost COTS Flight Modem with a User Handbook containing system capability and limitation descriptions. Additionally, since data transmission is by packetized Internet Protocol (IP), data can be received and commands initialed from practically any location with no infrastructure. The WFF, like most ranges, has been using GPS receivers on sounding rockets and long duration balloons for several years, The WFF Flight Modem contains a GPS receiver to provide vehicle position for tracking and vehicle recovery. The system architecture which integrates antennas, GPS receiver, commercial satellite packet data modem. and a single board computer with custom software is described and a number of technical challenges are discussed along with the plan for their resolution. These include antenna development, high Doppler rates, reliability, environmental ruggedness, hand over between satellites and data security. An aggressive test plan is included which in addition to environmental Testing measures bit error rate latency and antenna patterns. Additional flight tests are planned far the near future on aircraft, long duration balloons and sounding rockets and these results as well as the current status of the project arc reported. Use of the WFF Flight Modem on small satellites is also being pursued. The LEO satellite constellation altitude above 1400 km is not an obstacle because most spacecraft do not require continuous Communications. The challenge is scheduling where store and forward techniques for command are required and downlink when the communications link allows connection (above 60 percent of the time depending on the satellite altitude). Sophisticated scheduling techniques utilizing 2-line orbital element sets available on the NASA/NORAD Internet site could be implemented for rare special cases. The current 9600 baud rate of the LEO communications link may be increased With special techniques that are planned for development in the WFF Flight Modem project.
Author
Data Transmission; Modems; Navigation Satellites; Satellite Transmission; Telecommunication; Telemetry; In-Flight Monitoring; Satellite Tracking

20010020087 Boeing Co., Space and Communications Group, Huntsville, AL USA

Practicality of Using a Tether for Electrodynamic Reboost of the International Space Station

Blumer, J. H., Boeing Co., USA; Donahue, Benjamin B., Boeing Co., USA; Bangham, Michal E., Boeing Co., USA; [2001]; 7p; In English; Space Technology & Applications Forum, 11 Feb. 2001, Albuquerque, NM, USA

Contract(s)/Grant(s): NAS8-39400; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

ElectroDynamic (ED) Tethers can generate continuous low thrust in a low Earth orbit. An induced current running through the length of the tether reacts with the geomagnetic field to produce thrust. The amount of thrust scales with tether lens!th and current. The International Space Station (ISS) requires periodic reboost to maintain an approximately circular orbit t above the Earth. The baseline reboost method is a traditional bi-propellant rocket thruster and tankage system which must to be refueled via Soyuz / Progress or other launch vehicle. The estimated propellant costs associated with keeping ISS in the designated orbit over a 10-year life have been extremely high. The ED Tether would draw energy from the renewable ISS Solar Array electrical power system. Propulsion requirements for ISS vary depending on solar wind and other conditions. It is projected that a ED Tether could provide the majority of the required reboost thrust for ISS for a nominal solar year. For above nominal solar wind years the ISS would have to use the rocket reboost system, but at a greatly reduced level. Thus resulting in substantial cost savings, via the reduction in the number of Earth-to-orbit launch vehicle flights to the ISS that must bring reboost propellant. However, the purposes of this paper is to further Previous research on an ISS ED Tether and examine the operational and technical issues working against using a ED Tether on ISS. Issues such as Shuttle rendezvous and flight path concerns raise serious safety concerns and restrictions on tether use. Tether issues such as tether librations and off angle thrust raise concerns about impacts to microgravity payloads and the long-term effect on ISS orbital path and inclination. Operational issues such as peak power available to an ED Tether and allowable duty cycle may impose severe restrictions on tether design and ultimately limit the practicality of an ED Tether on ISS. Thus while at first glance the cost numbers appear to be strongly in favor of an ED Tether the limitations imposed by safety, operations and technical concerns may severely undermine the economic model. Possible Solutions to these problems have been investigated and proposed, however some items like off angle thrust are still being actively investigated for an adequate solution.

Author

Electrodynamics; Tethering; Tetherlines; Orbital Rendezvous; Soyuz Spacecraft; U.S.S.R. Space Program; International Space Station

20010020522 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Next-Generation Entry/Descent/Landing System for Mars Landers

Thurman, Sam W., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 296-297; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Many important scientific objectives for Mars exploration require the ability to land safely at select sites. The 'first-generation' entry, descent, and landing (EDL) systems used in previous missions imposed limitations on target site selection due to the delivery accuracy achievable and those systems' inability to recognize and avoid hazardous terrain. This abstract outlines key capabilities of a proposed second-generation EDL system, currently under development by a consortium of NASA centers, Industry, and academic institutions.

Author

Mars Exploration; Mars Missions; Mission Planning; Mars Landing; Descent

20010020530 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

A Miniature Mars Ascent Vehicle

Wilcox, Brian H., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 312-313; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Launch of payloads from the surface of the Mars is a central element in any Sample Return program, and represents one of the most important objectives of NASA planetary science and Human Exploration and Development of Space (HEDS) programs. Analysis of these samples in the sophisticated laboratories of Earth will give vastly more scientific as well as HEDS-relevant engineering and space-medicine knowledge of those bodies than can be performed from any feasible near-term miniaturized instruments. What is proposed here is a launch system with no moving parts of any kind: no gyroscope, no accelerometers, no control surfaces, and no thrust vector control.

Author

Launching; Mars Missions; Ascent; Spacecraft Instruments; Mars Exploration

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Estimates of Global Space Development in Operating an International Space Station ***Perkiraan Perkembangan Komersialisasi Antariksa Global Dengan Beroperasinya Stasiun Antariksa Internasional***

Sitindjak, Alfred, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Majalah LAPAN; July 2000; ISSN 0126-0480; Volume 2, No. 3, pp. 105-122; In Malay-Indonesian; Copyright; Avail: Issuing Activity

Various space efforts have entered into the industrialization and commercialization phase providing economic benefits for humankind. The eminent industrialization and commercialization of space efforts comprise, among others, of satellite fabrication, space vehicle launches, Earth segments, telecommunication services, remote sensing data and geographic information system (GIS), navigation services (receivers), and space manufacturing. In the last decade, global space industrialization has occupied one of the leading positions in world industries. In 1996, global revenues of space industrialization and commercialization were estimated to the amount of some $77 billion with involvement of 800,000 workers in various countries. Based on the analysis result, it is strongly believed that space industrialization and commercialization will continue to grow in the future, and it is estimated that the operation of the International Space Station starting in 2006 will highly accelerate industrialization and commercialization of space sectors such as Earth segments, telecommunications, and remote sensing services. Analysis methods applied in estimating the increase in such space sectors is based on judgement, taking into account influencing factors.

Author

International Space Station; Space Commercialization; Space Industrialization; Space Manufacturing

20010020951 NASA Marshall Space Flight Center, Huntsville, AL USA

Introduction: Aims and Requirements of Future Aerospace Vehicles, Chapter 1

Rodriguez, Pedro I., NASA Marshall Space Flight Center, USA; Smeltzer, Stanley S., III, NASA Marshall Space Flight Center, USA; [2001]; 24p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals and system-level requirements for the next generation aerospace vehicles emphasize safety, reliability, low-cost, and robustness rather than performance. Technologies, including new materials, design and analysis approaches, manufacturing and testing methods, operations and maintenance, and multidisciplinary systems-level vehicle development are key to increasing the safety and reducing the cost of aerospace launch systems. This chapter identifies the goals and needs of the next generation or advanced aerospace vehicle systems.

Author

Goals; Requirements; Specifications; Aerospace Systems; Aerospace Vehicles

20010021181 NASA Marshall Space Flight Center, Huntsville, AL USA

An Experimental Investigation of the Effects of Charging on the International Space Station

Schneider, Todd, NASA Marshall Space Flight Center, USA; Carruth, M. Ralph, NASA Marshall Space Flight Center, USA; Finckenor, Miria, NASA Marshall Space Flight Center, USA; Vaughn, Jason, NASA Marshall Space Flight Center, USA; Ferguson, Dale, NASA Glenn Research Center, USA; Heard, John, Clarion Univ. of Pennsylvania, USA; [2001]; 1p; In English; 7th; Spacecraft Charging Technology, 23-27 Apr. 2001, Noordwijk, Netherlands

Contract(s)/Grant(s): RTOP 478-88-50; No Copyright; Avail: Issuing Activity; Abstract Only

An experimental investigation has been undertaken to determine the effects associated with operating the International Space Station (ISS) without a Plasma Contactor Unit (PCU). The role of the PCU is to maintain the potential of the ISS to within 40 volts of the ambient plasma potential. In the event of a PCU failure, ISS structure may charge to - 160 volts with respect to the Low Earth Orbit (LEO) plasma, due to the use of high voltage photovoltaic solar arrays. Operation without a PCU will result in the charging of the oxide layers on anodized aluminum components facing into the RAM direction. In this investigation, arcs were observed as a result of anodized materials charging in a plasma environment. Actual ISS materials were used in the investigation. The materials included meteoroid and debris shield samples, as well as components from the Extravehicular Mobility Unit (EMU). Results show that the occurrence of arcs was dependent on several factors including material composition and applied voltage. The breakdown thresholds for the materials tested will be shown, as well as the voltage and current waveforms during an arc event. The damage resulting from an arc will also be described. In addition, a description of associated operational hazards resulting from arcing on the spacecraft will be provided.

Author

International Space Station; Electric Potential; Space Plasmas; Space Charge

20010021225 NASA Marshall Space Flight Center, Huntsville, AL USA

Life Testing of the Hollow Cathode Plasma Contactor for the ProSEDS Mission

Vaughn, Jason A., NASA Marshall Space Flight Center, USA; Schneider, Todd A., NASA Marshall Space Flight Center, USA; Finckenor, Miria M., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 7th; Spacecraft Charging Technology Conference, 23-27 Apr. 2001, Noordwijk, Netherlands

Contract(s)/Grant(s): RTOP 718-30-01; No Copyright; Avail: Issuing Activity; Abstract Only

The Propulsive Small Expendable Deployer System (ProSEDS) mission is designed to provide an on-orbit demonstration of the electrodynamic propulsion capabilities of tethers in space. The ProSEDS experiment will be a secondary payload on a Delta 11 unmanned expendable booster. A 5-km conductive tether is attached to the Delta 11 second stage and collects current from the low Earth orbit (LEO) plasma. A hollow cathode plasma contactor emits the collected electrons from the Delta II, completing the electrical circuit with the ambient plasma. The current flowing through the tether generates thrust based on the Lorentz Force Law. The thrust will be generated opposite to the velocity vector, slowing down the spacecraft and causing it to de-orbit in approximately 14 days compared to the normal 6 months. A 10-km non-conductive tether is between the conductive tether and an endmass containing several scientific instruments. The ProSEDS mission lifetime was set at I day because most of the primary objectives can be met in that time. The extended ProSEDS mission will be for as many days as possible, until the Delta 11 second stage burns up or the tether is severed by a micrometeoroid or space debris particle. The Hollow Cathode Plasma Contactor (HCPC) unit has been designed for a 12-day mission. Because of the science requirements to measure the background ambient plasma, the HCPC must operate on a duty cycle. Later in the ProSEDS mission, the HCPC is operated in a manner to allow charging of the secondary battery. Due to the unusual operating requirements by the ProSEDS mission, a development unit of the HCPC was built for thorough testing. This developmental unit was tested for a simulated ProSEDS mission, with measurements of the ability to start and stop during the duty cycle. These tests also provided valuable data for the ProSEDS software requirements. Qualification tests of the HCPC flight hardware are also discussed.

Author

Hollow Cathodes; Plasmas (Physics); Expendable Stages (Spacecraft); Electrodynamics; Space Missions; Plasma Lifetime; Performance Tests

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Mass Analysis of Condensation-Free Walls in a Spacecraft

Ren, Jian-Xun, Tsinghua Univ., China; Ji, Chao-Yue, Tsinghua Univ., China; Liang, Xin-Gang, Tsinghua Univ., China; Guo, Zeng-Yuan, Tsinghua Univ., China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 427-430; In Chinese; Copyright; Avail: Issuing Activity

In order to provide a reliable basis for the design of the optimal structure, it is necessary to investigate the wall mass constitutes of a pressurized spacecraft when thermal insulation and ventilation means are applied to prevent dewing on its inner wall. Physical and mathematical models for heat transfer process in the wall of a spacecraft were used to calculate the mass variation. Several factors associated- with operation parameters and configurations of the wall were evaluated. These factors influence the mass minimization on condition that the condensation on the inner surface is prohibited. The wall mass of a spacecraft reduces at first to a minimum value and then increases with the increasing ventilation flow rate while other conditions are kept unchanged. There exists a minimum wall mass, corresponding to a critical ventilation flow rate. The effects of ventilation, surface emissivity and thermal conductivity of the insulation on the mass minimization were presented. The influence of different dew points on the mass minimization was also investigated. Lower thermal conductivity of thermal insulation layer, lower emissivity of outer surface and higher emissivity of inner surface with suitable ventilation flow rate are expected because of their benefit to the reduction of wall mass of the spacecraft. Key words: spacecraft modules;dew condensing; ventilation; thermal insulation;mass minimization

Author

Walls; Thermal Insulation; Thermal Conductivity; Optimization; Mathematical Models; Condensing

20010021693 NASA Glenn Research Center, Cleveland, OH USA

Summary Report of Mission Acceleration Measurements for STS-95: Launched October 19, 1998

McPherson, Kevin, NASA Glenn Research Center, USA; Hrovat, Kevin, Tal-Cut Co., USA; February 2000; 46p; In English; CD-ROM contains the entire report including appendices presented in PDF format. Mission summary reports for STS-79 and -89 are also included as bonus reports; This report is a supplement to NASA report NASA/TM-1999-209677

Contract(s)/Grant(s): RTOP 101-46-0A

Report No.(s): NASA/TM-2000-209677; E-12109; NAS 1.15:209677; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; C01, CD-ROM

John H. Glenn's historic return to space was a primary focus of the STS-95 mission. The Hubble Space Telescope (HST) orbital Systems Test (HOST), an STS-95 payload, was an in-flight demonstration of HST components to be installed during the next HST servicing mission. One of the components under evaluation was the cryocooler for the Near Infrared Camera and Multi-Object Spectrometer (NICMOS). Based on concerns about vibrations from the operation of the NICMOS cryocooler affecting the overall HST line-of-sight requirements, the Space Acceleration Measurement System for Free-Flyers (SAMS-FF) was employed to measure the vibratory environment of the STS-95 mission, including any effects introduced by the NICMOS cryocooler. The STS-95 mission represents the first STS mission supported by SAMS-FF. Utilizing a Control and Data Acquisition Unit (CDU) and two triaxial sensor heads (TSH) mounted on the HOST support structure in Discovery's cargo bay, the SAMS-FF and the HOST project were able to make vibratory measurements both on-board the vibration-isolated NICMOS cryocooler and off-board the cryocooler mounting plate. by comparing the SAMS-FF measured vibrations on-board and off-board the NICMOS cryocooler, HST engineers could assess the cryocooler g-jitter effects on the HST line-of-sight requirements. The acceleration records from both SAMS-FF accelerometers were analyzed and significant features of the microgravity environment are detailed in this report.
Author
Acceleration Measurement; Hubble Space Telescope; Space Transportation System Flights; Vibration Measurement

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SPACECRAFT INSTRUMENTATION AND ASTRIONICS

Includes the design, manufacture, or use of devices for the purpose of measuring, detecting, controlling, computing, recording, or processing data related to the operation of space vehicles or platforms. For related information, see also 06 Aircraft Instrumentation and Avionics; For spaceborne instruments not integral to the vehicle itself see 35 Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy, Instrumentation and Photography; For spaceborne telescopes and other astronomical instruments see 89 Astronomy.

20010020260 NASA Goddard Space Flight Center, Greenbelt, MD USA
Using Model-Based Reasoning for Autonomous Instrument Operation - Lessons Learned From IMAGE/LENA
Johnson, Michael A., NASA Goddard Space Flight Center, USA; Rilee, Michael L., NASA Goddard Space Flight Center, USA; Truszkowski, Walt, NASA Goddard Space Flight Center, USA; Bailin, Sidney C., Knowledge Evolution, Inc., USA; Jan. 17, 2001; 9p; In English; AIAA Symposium on Robust Autonomy, 26 - 28 Mar. 2001, Palo Alto, CA, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Model-based reasoning has been applied as an autonomous control strategy on the Low Energy Neutral Atom (LENA) instrument currently flying on board the Imager for Magnetosphere-to-Aurora Global Exploration (IMAGE) spacecraft. Explicit models of instrument subsystem responses have been constructed and are used to dynamically adapt the instrument to the spacecraft's environment. These functions are cast as part of a Virtual Principal Investigator (VPI) that autonomously monitors and controls the instrument. In the VPI's current implementation, LENA's command uplink volume has been decreased significantly from its previous volume; typically, no uplinks are required for operations. This work demonstrates that a model-based approach can be used to enhance science instrument effectiveness. The components of LENA are common in space science instrumentation, and lessons learned by modeling this system may be applied to other instruments. Future work involves the extension of these methods to cover more aspects of LENA operation and the generalization to other space science instrumentation.
Author
Mathematical Models; Automatic Control; Autonomy; Neutral Atoms

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SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also 07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations; and 44 Energy Production and Conversion.

20010019989 Pratt and Whitney Aircraft, Liquid Space Propulsion, West Palm Beach, FL USA
2nd Generation RLV Risk Reduction Definition Program: Pratt & Whitney Propulsion Risk Reduction Requirements Program (TA-3 & TA-4) ***Final Report, 28 Jul. 2000 - 31 Jan. 2001***
Matlock, Steve, Pratt and Whitney Aircraft, USA; Jan. 31, 2001; 106p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS8-00168
Report No.(s): LS-50; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This is the final report and addresses all of the work performed on this program. Specifically, it covers vehicle architecture background, definition of six baseline engine cycles, reliability baseline (space shuttle main engine QRAS), and component level reliability/performance/cost for the six baseline cycles, and selection of 3 cycles for further study. This report further addresses technology improvement selection and component level reliability/performance/cost for the three cycles selected for further study, as well as risk reduction plans, and recommendation for future studies.
Derived from text
Risk; Propulsion

20010020000 NASA Marshall Space Flight Center, Huntsville, AL USA
Analysis of Proposed Fully Internal Compression Geometry for an RBCC Engine
Rojas-Oviedo, Ruben, Alabama A & M Univ., USA; Deng, Z. T., Alabama A & M Univ., USA; Harris, Lawanna, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 39th; Aerospace Science, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2001-0824; No Copyright; Avail: Issuing Activity; Abstract Only

A proposed fully internal compression geometry for rocket based combined cycle (RBCC) engine, STEPER (Space Transportation Engine Prototype for Engineering Research), was investigated numerically in this paper. The Steper-engine has been designed to power a reusable launch vehicle that may take-off horizontally, accelerate to Mach 2, sustain supersonic air-breathing combustion to Mach 10 while ascending to 50 km and then transition to full rocket propulsion to enter low earth orbit. The proposed engine geometry replaces the alternative conical center-body and supporting struts with a quasi-stationary upper and lower compression ramps. A cluster of thruster nozzles was embedded inside the ramp and provide thrust to the engine with additional fuel existing at the nozzle exit. The proposed geometry eases the problem of cooling hard to reach cavities. This design geometry was investigated numerically. Both perfect gas and finite rate chemistry analysis were performed. Results indicated that the emanating oblique shock waves produced by the upper and lower compression ramps intersect and the reflecting shocks do not reach the wall of the combustor but rather downstream. This effect allows the formation of two distinct regions that can be considered the core region and the surrounding flow region. The core region has higher pressure and higher temperature than the surrounding region. Therefore providing some reduction to the thermal loads to the inner walls.
Author
Prototypes; Rocket-Based Combined-Cycle Engines; Numerical Analysis; Spacecraft Propulsion

20010020023 NASA Marshall Space Flight Center, Huntsville, AL USA
PDE Nozzle Optimization Using a Genetic Algorithm
Billings, Dana, NASA Marshall Space Flight Center, USA; [2000]; 8p; In English; 12th; PERC Annual Symposium on Propulsion, 26-27 Oct. 2000, Cleveland, OH, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Genetic algorithms, which simulate evolution in natural systems, have been used to find solutions to optimization problems that seem intractable to standard approaches. In this study, the feasibility of using a GA to find an optimum, fixed profile nozzle for a pulse detonation engine (PDE) is demonstrated. The objective was to maximize impulse during the detonation wave passage and blow-down phases of operation. Impulse of each profile variant was obtained by using the CFD code Mozart/2.0 to simulate the transient flow. After 7 generations, the method has identified a nozzle profile that certainly is a candidate for optimum solution. The constraints on the generality of this possible solution remain to be clarified.
Author
Detonation Waves; Genetic Algorithms; Optimal Control

20010020058 NASA Marshall Space Flight Center, Huntsville, AL USA
Fabrication of Composite Combustion Chamber/Nozzle for Fastrac Engine
Lawerence, T., NASA Marshall Space Flight Center, USA; Beshears, R., NASA Marshall Space Flight Center, USA; Burlingame, S., NASA Marshall Space Flight Center, USA; Peters, W., NASA Marshall Space Flight Center, USA; Prince, M., NASA Marshall Space Flight Center, USA; Suits, M., NASA Marshall Space Flight Center, USA; Tillery, S., NASA Marshall Space Flight Center, USA; Burns, L., Thiokol Propulsion, USA; Kovach, M., Thiokol Propulsion, USA; Roberts, K., Thiokol Propulsion, USA; [2000]; 11p; In English; AMPET Conference, 18-20 Sep. 2000, Huntsville, AL, USA
Contract(s)/Grant(s): NAS8-39749; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Fastrac Engine developed by the Marshall Space Flight Center for the X-34 vehicle began as a low cost engine development program for a small booster system. One of the key components to reducing the engine cost was the development of an inexpensive combustion chamber/nozzle. Fabrication of a regeneratively cooled thrust chamber and nozzle was considered too expensive and time consuming. In looking for an alternate design concept, the Space Shuttle's Reusable Solid Rocket Motor Project provided an extensive background with ablative composite materials in a combustion environment. An integral combustion chamber/nozzle was designed and fabricated with a silica/phenolic ablative liner and a carbon/epoxy structural overwrap. This paper describes the fabrication process and developmental hurdles overcome for the Fastrac engine one-piece composite combustion chamber/nozzle.
Author
Fabrication; Combustion Chambers; Composite Wrapping; Thrust Chambers; Divergent Nozzles; Rocket Nozzles

20010020152 NASA Marshall Space Flight Center, Huntsville, AL USA
Analysis of a Nuclear Enhanced Airbreathing Rocket for Earth to Orbit Applications
Adams, Robert B., NASA Marshall Space Flight Center, USA; Landrum, D. Brian, Alabama Univ., USA; [2001]; 21p; In English; 37th; Joint Propulsion, 8-11 Jul. 2001, Salt Lake City, UT, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The proposed engine concept is the Nuclear Enhanced Airbreathing Rocket (NEAR). The NEAR concept uses a fission reactor to thermally heat a propellant in a rocket plenum. The rocket is shrouded, thus the exhaust mixes with ingested air to provide additional thermal energy through combustion. The combusted flow is then expanded through a nozzle to provide thrust.
Author
Air Breathing Engines; Air Breathing Boosters; Rocket-Based Combined-Cycle Engines; Nuclear Engine For Rocket Vehicles

20010020153 NASA Marshall Space Flight Center, Huntsville, AL USA
Dynamic Characterization of an Inflatable Concentrator for Solar Thermal Propulsion
Leigh, Larry, South Dakota State Univ., USA; Hamidzadeh, Hamid, South Dakota State Univ., USA; Tinker, Michael L., NASA Marshall Space Flight Center, USA; [2001]; 6p; In English; Structures, Structural Dynamics, and Materials, 16-19 Apr. 2001, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 632-10-20
Report No.(s): AIAA Paper 2001-1406; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

An inflatable structural system that is a technology demonstrator for solar thermal propulsion and other applications is characterized for structural dynamic behavior both experimentally and computationally. The inflatable structure is a pressurized assembly developed for use in orbit to support a Fresnel lens or inflatable lenticular element for focusing sunlight into a solar thermal rocket engine. When the engine temperature reaches a pre-set level, the propellant is injected into the engine, absorbs heat from an exchanger, and is expanded through the nozzle to produce thrust. The inflatable structure is a passively adaptive system in that a regulator and relief valve are utilized to maintain pressure within design limits during the full range of orbital conditions. Modeling and test activities are complicated by the fact that the polyimide film material used for construction of the inflatable is nonlinear, with modulus varying as a function of frequency, temperature, and level of excitation. Modal vibration testing and finite element modeling are described in detail in this paper. The test database is used for validation and modification of the model. This work is highly significant because of the current interest in inflatable structures for space application, and because of the difficulty in accurately modeling such systems.
Author
Concentrators; Inflatable Structures; Adaptive Control; Vibration Tests

20010020157 NASA Marshall Space Flight Center, Huntsville, AL USA
FDNS CFD Code Benchmark for RBCC Ejector Mode Operation: Continuing Toward Dual Rocket Effects
West, Jeff, NASA Marshall Space Flight Center, USA; Ruf, Joseph H., NASA Marshall Space Flight Center, USA; [2000]; 8p; In English; 12th; Propulsion, 26-27 Oct. 2000, Cleveland, OH, USA; Sponsored by Pennsylvania State Univ., USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Computational Fluid Dynamics (CFD) analysis results are compared with benchmark quality test data from the Propulsion Engineering Research Center's (PERC) Rocket Based Combined Cycle (RBCC) experiments to verify fluid dynamic code and application procedures. RBCC engine flowpath development will rely on CFD applications to capture the multi -dimensional fluid dynamic interactions and to quantify their effect on the RBCC system performance. Therefore, the accuracy of these CFD codes must be determined through detailed comparisons with test data. The PERC experiments build upon the well-known 1968 rocket-ejector experiments of Odegaard and Stroup by employing advanced optical and laser based diagnostics to evaluate mixing and

secondary combustion. The Finite Difference Navier Stokes (FDNS) code [2] was used to model the fluid dynamics of the PERC RBCC ejector mode configuration. Analyses were performed for the Diffusion and Afterburning (DAB) test conditions at the 200-psia thruster operation point, Results with and without downstream fuel injection are presented.
Author
Combustion; Computational Fluid Dynamics; Diagnosis; Engine Design; Fuel Injection; Rocket-Based Combined-Cycle Engines

20010020206 Thiokol Corp., Brigham City, UT USA
A Thermal-Flow Code for Modeling Gas Dynamics and Heat Transfer in Space Shuttle Solid Rocket Motor Joints
Wang, Qun-Zhen, Thiokol Corp., USA; Mathias, Edward C., Thiokol Corp., USA; Heman, Joe R., Thiokol Corp., USA; Smith, Cory W., Thiokol Corp., USA; [2000]; 45p; In English
Contract(s)/Grant(s): NAS8-38100; Copyright; Avail: Issuing Activity

A new thermal-flow simulation code, called SFLOW, has been developed to model the gas dynamics, heat transfer, as well as O-ring and flow path erosion inside the space shuttle solid rocket motor joints by combining SINDA/G (registered), a commercial thermal analyzer, and SHARP R, a general-purpose computational fluid dynamics (CFD) code developed at Thiokol Propulsion. The pressure, temperature, and velocity of the combustion gas in the leak paths are calculated in SHARP (registered) by solving the time-dependent Navier-Stokes equations while the heat conduction in the solid is modeled by SINDA/G (registered), SHARP (registered), and SINDA/G (registered) are coupled by the heat flux at the solid-gas interface. The results of a few test cases from SFLOW are compared with exact solutions or experimental data. These cases include both steady and transient problems involving area change, friction, heat transfer between gas and solid, as well as mass addition due to the erosion of solid walls. In addition, SFLOW is applied to model a set of space shuttle rocket motor nozzle joint subscale hot-flow tests and the predicted pressures, temperatures (both gas and solid), as well as O-ring erosions are compared with the experimental data.
Author
Computerized Simulation; Computer Programming; Thermal Analysis; Thermal Simulation; Models

20010020208 NASA Marshall Space Flight Center, Huntsville, AL USA
Evaluation of Vortex Chamber Concepts for Liquid Rocket Engine Applications
Trinh, Huu Phuoc, NASA Marshall Space Flight Center, USA; Knuth, Williams, Orbital Technologies Corp., USA; Michaels, Scott, Army Missile Command, USA; [2000]; 8p; In English; 12th; Propulsion, 26-27 Oct. 2000, Cleveland, OH, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Rocket-based combined-cycle engines (RBBC) being considered at NASA for future generation launch vehicles feature clusters of small rocket thrusters as part of the engine components. Depending on specific RBBC concepts, these thrusters may be operated at various operating conditions including power level and/or propellant mixture ratio variations. to pursue technology developments for future launch vehicles, NASA/Marshall Space Flight Center (MSFC) is examining vortex chamber concepts for the subject cycle engine application. Past studies indicated that the vortex chamber schemes potentially have a number of advantages over conventional chamber methods. Due to the nature of the vortex flow, relatively cooler propellant streams tend to flow along the chamber wall. Hence, the thruster chamber can be operated without the need of any cooling techniques. This vortex flow also creates strong turbulence, which promotes the propellant mixing process. Consequently, the subject chamber concepts not only offer the system simplicity but they also would enhance the combustion performance. The test results showed that the chamber performance was markedly high even at a low chamber length-to- diameter ratio (L/D). This incentive can be translated to a convenience in the thrust chamber packaging.
Derived from text
Thrust Chambers; Combustion Chambers; Liquid Propellant Rocket Engines; Rocket-Based Combined-Cycle Engines

20010020215 NASA Marshall Space Flight Center, Huntsville, AL USA
Physical Limitations of Nuclear Propulsion for Earth to Orbit
Blevins, John A., NASA Marshall Space Flight Center, USA; Patton, Bruce, NASA Marshall Space Flight Center, USA; Rhys, Noah O., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Joint Propulsion Conference, 8-11 Jul. 2001, Salt Lake City, UT, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

An assessment of current nuclear propulsion technology for application in Earth to Orbit (ETO) missions has been performed. It can be shown that current nuclear thermal rocket motors are not sufficient to provide single stage performance as has been stated by previous studies. Further, when taking a systems level approach, it can be shown that NTRs do not compete well with chemical engines where thrust to weight ratios of greater than I are necessary, except possibly for the hybrid chemical/nuclear LANTR

(LOX Augmented Nuclear Thermal Rocket) engine. Also, the ETO mission requires high power reactors and consequently large shielding weights compared to NTR space missions where shadow shielding can be used. In the assessment, a quick look at the conceptual ASPEN vehicle proposed in 1962 in provided. Optimistic NTR designs are considered in the assessment as well as discussion on other conceptual nuclear propulsion systems that have been proposed for ETO. Also, a quick look at the turbulent, convective heat transfer relationships that restrict the exchange of nuclear energy to thermal energy in the working fluid and consequently drive the reactor mass is included.
Author
Nuclear Propulsion; Nuclear Rocket Engines; Space Missions; Earth Orbital Environments

20010020218 NASA Marshall Space Flight Center, Huntsville, AL USA
Space Fission Propulsion System Development Status
Houts, Mike, NASA Marshall Space Flight Center, USA; VanDyke, Melissa, NASA Marshall Space Flight Center, USA; Godfroy, Tom, NASA Marshall Space Flight Center, USA; Pedersen, Kevin, NASA Marshall Space Flight Center, USA; Martin, James, NASA Marshall Space Flight Center, USA; Dickens, Ricky, NASA Marshall Space Flight Center, USA; Williams, Eric, NASA Marshall Space Flight Center, USA; Harper, Roger, NASA Marshall Space Flight Center, USA; Salvail, Pat, NASA Marshall Space Flight Center, USA; Hrbud, Ivana, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Outer Planet Exploration, 21-23 Feb. 2001, Houston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The world's first man-made self-sustaining fission reaction was achieved in 1942. Since then fission has been used to propel submarines, generate tremendous amounts of electricity, produce medical isotopes, and provide numerous other benefits to society. Fission systems operate independently of solar proximity or orientation, and are thus well suited for deep spare or planetary surface missions. In addition, the fuel for fission systems (enriched uranium) is virtually non-radioactive. The primary safety issue with fission systems is avoiding inadvertent system start - addressing this issue through proper system design is straightforward. Despite the relative simplicity and tremendous potential of space fission systems, the development and utilization of these systems has proven elusive. The first use of fission technology in space occurred 3 April 1965 with the US launch of the SNAP-10A reactor. There have been no additional US uses of space fission system. While space fission system were used extensively by the former Soviet Union, their application was limited to earth-orbital missions. Early space fission systems must be safely and affordably utilized if Ae are to reap the benefits of advanced space fission systems.
Author
Aerospace Systems; Systems Engineering; Fission; Fuel Production; Fuel Systems; Propulsion System Configurations

20010020227 NASA Marshall Space Flight Center, Huntsville, AL USA
Design and Development of a Peroxide Hybrid Upper Stage Propulsion System
Abel, Terry, Lockheed Martin Space Systems Co., USA; Markopoulos, Pete, Lockheed Martin Space Systems Co., USA; Lund, Gary, Thiokol Propulsion, USA; Prince, Andrew, Thiokol Propulsion, USA; Claflin, Scott, Boeing Co., USA; Caravella, Joe, Boeing Co., USA; McNeal, Curtis, NASA Marshall Space Flight Center, USA; [2000]; 9p; In English; 3rd; International Hydrogen Peroxide Propulsion, 13 Nov. 2000, Gulf Port, MS, USA
Contract(s)/Grant(s): NAS8-00138; Copyright; Avail: Issuing Activity

Growing international competition for delivery of orbital payloads has prompted increased government and industry investment in advanced propulsion systems. NASA is funding efforts to investigate peroxide based propulsion systems. Systems being considered include peroxide/kerosene bi-propellant systems and hybrid systems. Evaluation of candidate applications suggests a recurring and non-recurring cost benefit can be derived from the development of a peroxide hybrid upper stage. Hybrid rockets have long been considered a low cost alternative due to their inherent safety, storability, and operational efficiency. Combining these features with the clean burning, storable, non-toxic attributes of hydrogen peroxide yields an excellent combination. NASA has recently funded an effort to develop such a hybrid system. The team, which is comprised of Lockheed Martin, Thiokol, and Rocketdyne, seeks to design, integrate, and test a peroxide thrust chamber assembly concept that will be capable of delivering 10,000 pounds of thrust at a vacuum specific impulse of 320 seconds for approximately 360 seconds. Variable thrust, multiple starts, and throttling will be demonstrated. The candidate system chosen for investigation is a gas generator (GG) design incorporating a partially oxidized fuel-rich propellant with combustion initiated by, and made more efficient with, the injection of high concentration hydrogen peroxide. Multiple starts, steady-state operation, and extinguishment of the hybrid motors is planned as part of this investigation. This paper will summarize progress to date associated with the Peroxide Hybrid Upper Stage Program.
Author
Hybrid Propulsion; Rocket Engines; Engine Design; Product Development; Propulsion System Configurations

20010020381 NASA Marshall Space Flight Center, Huntsville, AL USA

Gasdynamic Mirror Fusion Propulsion Experiment

Emrich, William J., Jr., NASA Marshall Space Flight Center, USA; [2001]; 6p; In English; Space Technologies Applications, 11-14 Feb. 2001, Albuquerque, NM, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Nuclear fusion appears to be the most promising concept for producing extremely high specific impulse rocket engines. One particular fusion concept which seems to be particularly well suited for fusion propulsion applications is the gasdynamic mirror (GDM). This device would operate at much higher plasma densities and with much larger LD ratios than previous mirror machines. Several advantages accrue from such a design. First, the high LA:) ratio minimizes to a large extent certain magnetic curvature effects which lead to plasma instabilities causing a loss of plasma confinement. Second, the high plasma density will result in the plasma behaving much more Re a conventional fluid with a mean free path shorter than the length of the device. This characteristic helps reduce problems associated with ”loss cone” microinstabilities. An experimental GDM device is currently being constructed at the NASA Marshall Space Flight Center to provide an initial assessment of the feasibility of this type of propulsion system. Initial experiments are expected to commence in the late fall of 2000.

Author

Experimentation; Gas Dynamics; Mirror Fusion; Nuclear Fusion; Magnetic Mirrors; Fusion Propulsion

20010020382 NASA Marshall Space Flight Center, Huntsville, AL USA

Space Fission Propulsion Testing and Development Progress, Phase 1

VanDyke, Melissa, NASA Marshall Space Flight Center, USA; Houts, Mike, NASA Marshall Space Flight Center, USA; Pedersen, Kevin, NASA Marshall Space Flight Center, USA; Godfroy, Tom, NASA Marshall Space Flight Center, USA; Dickens, Ricky, NASA Marshall Space Flight Center, USA; Poston, David, Los Alamos National Lab., USA; Reid, Bob, Los Alamos National Lab., USA; Salvail, Pat, NASA Marshall Space Flight Center, USA; Ring, Peter, Advanced Methods and Materials, USA; [2001]; 7p; In English; Space Technologies Applications International Forum Conference, 11-14 Feb. 2001, Albuquerque, NM, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Successful development of space fission systems will require an extensive program of affordable and realistic testing. In addition to tests related to design/development of the fission system, realistic testing of the actual flight unit must also be performed. Testing can be divided into two categories, non-nuclear tests and nuclear tests. Full power nuclear tests of space fission systems we expensive, time consuming, and of limited use, even in the best of programmatic environments. If the system is designed to operate within established radiation damage and fuel burn up limits while simultaneously being designed to allow close simulation of heat from fission using resistance heaters, high confidence in fission system performance and lifetime can be attained through a series of non-nuclear tests. Non-nuclear tests are affordable and timely, and the cause of component and system failures can be quickly and accurately identified. MSFC is leading a Safe Affordable Fission Engine (SAFE) test series whose ultimate goal is the demonstration of a 300 kW flight configuration system using non-nuclear testing. This test series is carried out in collaboration with other NASA centers, other government agencies, industry, and universities. If SAFE-related nuclear tests are desired they will have a high probability of success and can be performed at existing nuclear facilities. The paper describes the SAFE non-nuclear test series, which includes test article descriptions, test results and conclusions, and future test plans.

Author

Aerospace Systems; Fission; Propulsion System Performance; Engine Tests

20010020383 NASA Marshall Space Flight Center, Huntsville, AL USA

Options For Development of Space Fission Propulsion Systems

Houta, Mike, NASA Marshall Space Flight Center, USA; VanDyke, Melissa, NASA Marshall Space Flight Center, USA; Godfroy, Tom, NASA Marshall Space Flight Center, USA; Pedersen, Kevin, NASA Marshall Space Flight Center, USA; Martin, James, NASA Marshall Space Flight Center, USA; Dickens, Ricky, NASA Marshall Space Flight Center, USA; Salvail, Pat, NASA Marshall Space Flight Center, USA; Hrbud, Ivana, NASA Marshall Space Flight Center, USA; [2001]; 12p; In English; Space Technologies Applications International Forum Conference, 11-14 Feb. 2001, Albuquerque, NM, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Fission technology can enable rapid, affordable access to any point in the solar system. Potential fission-based transportation options include high specific power continuous impulse propulsion systems and bimodal nuclear thermal rockets. Despite their tremendous potential for enhancing or enabling deep space and planetary missions, to date space fission system have only been used in Earth orbit. The first step towards utilizing advanced fission propulsion systems is development of a safe, near-term,

affordable fission system that can enhance or enable near-term missions of interest. An evolutionary approach for developing space fission propulsion systems is proposed.
Author
Deep Space; Fission; Space Missions; Aerospace Systems; Propulsion System Performance; Research and Development

20010020385 NASA Marshall Space Flight Center, Huntsville, AL USA
Propulsive Small Expendable Deployer System (ProSEDS)
Ballance, Judy, NASA Marshall Space Flight Center, USA; Johnson, Les, NASA Johnson Space Center, USA; Oct. 16, 2000; 6p; In English; Space Technology and Applications International Forum (STAIF), 11-15 Feb. 2001, Albuquerque, NM, USA; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Propulsive Small Expendable Deployer System (ProSEDS) space experiment will demonstrate the use of an electrodynamic tether propulsion system to generate thrust in space by decreasing the orbital altitude of a Delta II Expendable Launch Vehicle (ELV) second stage. ProSEDS, which is planned to fly in 2001, will use the flight proven Small Expendable Deployer System (SEDS) to deploy a tether (5km bare wire plus 10 km spectra or dyneema) from a Delta II second stage to achieve approximately 0.4N drag thrust. ProSEDS will utilize the tether-generated current to provide limited spacecraft power. The ProSEDs instrumentation includes a Langmuir probe and Differential Ion Flux Probe, which will determine the characteristics of the ambient ionospheric plasma. Two Global Positioning System (GPS) receivers will be used (one on the Delta and one on the endmass) to help determine tether dynamics and to limit transmitter operations to occasions when the spacecraft is over selected ground stations, The flight experiment is a precursor to the more ambitious electrodynamic tether upper stage demonstration mission, which will be capable of orbit raising, lowering and inclination changes-all using electrodynamic thrust. An immediate application of ProSEDS technology is for the deorbit of spent satellites for orbital debris mitigation. In addition to the use of this technology to provide orbit transfer and debris mitigation it may also be an attractive option for future missions to Jupiter and any other planetary body with a magnetosphere.
Author
Spaceborne Experiments; Tethered Satellites; Spacecraft Propulsion; Space Missions; Electrodynamics; Expendable Stages (Spacecraft); Delta Launch Vehicle

20010020388 NASA Marshall Space Flight Center, Huntsville, AL USA
Preliminary Photon Pressure Measurements Using a Solar Simulator
Gray, Perry A., NASA Marshall Space Flight Center, USA; Edwards, David L., NASA Marshall Space Flight Center, USA; Carruth, M. Ralph, Jr., NASA Marshall Space Flight Center, USA; [2001]; 3p; In English; 39th; Aerospace Sciences Meeting, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS8-40789; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Initial proof of concept photon momentum measurements reported verifying photon pressure on a simulated sail material can be measured under high vacuum conditions using a full spectrum solar simulator and a vacuum compatible force measurement system. Second order effects such as sample reflectivity, beam uniformity, radiometric flux measurement accuracy, and the optical system have been accounted for in evaluating these measurements.
Author
Momentum; Photons; Solar Simulators; Pressure Measurement; Vacuum Systems

20010020392 NASA Marshall Space Flight Center, Huntsville, AL USA
Global Design Optimization for Aerodynamics and Rocket Propulsion Components
Shyy, Wei, Florida Univ., USA; Papila, Nilay, Florida Univ., USA; Vaidyanathan, Rajkumar, Florida Univ., USA; Tucker, Kevin, NASA Marshall Space Flight Center, USA; [2000]; 113p; In English; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Modern computational and experimental tools for aerodynamics and propulsion applications have matured to a stage where they can provide substantial insight into engineering processes involving fluid flows, and can be fruitfully utilized to help improve the design of practical devices. In particular, rapid and continuous development in aerospace engineering demands that new design concepts be regularly proposed to meet goals for increased performance, robustness and safety while concurrently decreasing cost. to date, the majority of the effort in design optimization of fluid dynamics has relied on gradient-based search algorithms. Global optimization methods can utilize the information collected from various sources and by different tools. These methods offer multi-criterion optimization, handle the existence of multiple design points and trade-offs via insight into the entire design space, can easily perform tasks in parallel, and are often effective in filtering the noise intrinsic to numerical and experimental data. However, a successful application of the global optimization method needs to address issues related to data requirements with an increase

in the number of design variables, and methods for predicting the model performance. In this article, we review recent progress made in establishing suitable global optimization techniques employing neural network and polynomial-based response surface methodologies. Issues addressed include techniques for construction of the response surface, design of experiment techniques for supplying information in an economical manner, optimization procedures and multi-level techniques, and assessment of relative performance between polynomials and neural networks. Examples drawn from wing aerodynamics, turbulent diffuser flows, gas-gas injectors, and supersonic turbines are employed to help demonstrate the issues involved in an engineering design context. Both the usefulness of the existing knowledge to aid current design practices and the need for future research are identified.
Author
Design Analysis; Optimization; Aerodynamics; Propulsion System Configurations; Computation; Rocket Engine Design; Software Development Tools; Experiment Design

20010020394 NASA Marshall Space Flight Center, Huntsville, AL USA
Status of Pulsed Inductive Thruster Research
Hrbud, Ivana, NASA Marshall Space Flight Center, USA; LaPointe, Michael, Ohio Aerospace Inst., USA; Vondra, Robert, TRW, Inc., USA; Dailey, C. Lee, RLD Associates, Inc., USA; Lovberg, Ralph, RLD Associates, Inc., USA; [2001]; 7p; In English; Space Technologies Applications, 11-14 Feb. 2001, Albuquerque, NM, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The TRW Pulsed Inductive Thruster (PIT) is an electromagnetic propulsion system that can provide high thrust efficiency over a wide range of specific impulse values. In its basic form, the PIT consists of a flat spiral coil covered by a thin dielectric plate. A pulsed gas injection nozzle distributes a thin layer of gas propellant across the plate surface at the same time that a pulsed high current discharge is sent through the coil. The rising current creates a time varying magnetic field, which in turn induces a strong azimuthal electric field above the coil. The electric field ionizes the gas propellant and generates an azimuthal current flow in the resulting plasma. The current in the plasma and the current in the coil flow in opposite directions, providing a mutual repulsion that rapidly blows the ionized propellant away from the plate to provide thrust. The thrust and specific impulse can be tailored by adjusting the discharge power, pulse repetition rate, and propellant mass flow, and there is minimal if any erosion due to the electrodeless nature of the discharge. Prior single-shot experiments performed with a 1-meter diameter version of the PIT at TRW demonstrated specific impulse values between 2,000 seconds and 8,000 seconds, with thruster efficiencies exceeding 55% for ammonia and hydrazine propellants. This paper outlines current and planned activities to transition the single shot device into a multiple repetition rate thruster capable of supporting future DOD and NASA strategic enterprise missions.
Author
Rocket Engines; Electromagnetic Propulsion; High Thrust; Jet Thrust; Rocket Thrust

20010020916 Pennsylvania State Univ., Dept. of Mechanical and Nuclear Engineering, University Park, PA USA
Status Report on the Penn State RBCC Test Program
Cramer, J., NASA Marshall Space Flight Center, USA; Lehman, M., Pennsylvania State Univ., USA; Pal, S., Pennsylvania State Univ., USA; Lee, S.-Y., Pennsylvania State Univ., USA; Santoro, R., Pennsylvania State Univ., USA; [2000]; 9p; In English; 12th; Propulsion, 26-27 Oct. 2000, Cleveland, OH, USA; Sponsored by Pennsylvania State Propulsion Engineering Research Center, USA
Contract(s)/Grant(s): NAS8-40890; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The status of the RBCC ejector mode research program at Penn State is reviewed. Recent hardware modifications and measurement system improvements are discussed, including the motivation for these changes. Results from a series of tests with a single thruster configuration at a chamber pressure of 200 psia and with an area ratio 3.3 nozzle are presented. These results indicate that the primary (rocket exhaust) and secondary (entrained air) flow streams mix much more rapidly than a previous test series with an area ratio of 6.0 nozzle. Finally, the plans for a test series with a twin thruster configuration are discussed.
Author
Ejectors; Rocket Engines; Flow Distribution; Rocket Firing; Test Firing; Rocket Engine Design; Engine Tests

20010020917 NASA Marshall Space Flight Center, Huntsville, AL USA
Future Modeling Needs in Pulse Detonation Rocket Engine Design
Meade, Brian, NASA Marshall Space Flight Center, USA; Talley, Doug, Air Force Research Lab., USA; Mueller, Donn, Adroit Systems, Inc., USA; Tew, Dave, United Technologies Research Center, USA; Guidos, Mike, NASA Marshall Space Flight Center, USA; Seymour, Dave, NASA Marshall Space Flight Center, USA; [2001]; 22p; In English; 39th; Aerospace Sciences Meeting and Exhibit, 10 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents a performance model rocket engine design that takes advantage of pulse detonation to generate thrust. The contents include: 1) Introduction to the Pulse Detonation Rocket Engine (PDRE); 2) PDRE modeling issues and options; 3) Discussion of the PDRE Performance Workshop held at Marshall Space Flight Center; and 4) Identify needs involving an open performance model for Pulse Detonation Rocket Engines. This paper is in viewgraph form.
CASI
Detonation; Rocket Engine Design; Aircraft Models; Propulsion System Performance

20010021214 NASA Marshall Space Flight Center, Huntsville, AL USA
Accomplishments of the Advanced Reusable Technologies (ART) RBCC Project at NASA/Marshall Space Flight Center
Nelson, Karl W., NASA Marshall Space Flight Center, USA; [2001]; 2p; In English; 15th; Airbreathing Engines, 2-7 Sep. 2001, Bangalore, India; No Copyright; Avail: Issuing Activity; Abstract Only

The focus of the NASA / Marshall Space Flight Center (MSFC) Advanced Reusable Technologies (ART) project is to advance and develop Rocket-Based Combined-Cycle (RBCC) technologies. The ART project began in 1996 as part of the Advanced Space Transportation Program (ASTP). The project is composed of several activities including RBCC engine ground testing, tool development, vehicle / mission studies, and component testing / development. The major contractors involved in the ART project are Aerojet and Rocketdyne. A large database of RBCC ground test data was generated for the air-augmented rocket (AAR), ramjet, scramjet, and ascent rocket modes of operation for both the Aerojet and Rocketdyne concepts. Transition between consecutive modes was also demonstrated as well as trajectory simulation. The Rocketdyne freejet tests were conducted at GASL in the Flight Acceleration Simulation Test (FAST) facility. During a single test, the FAST facility is capable of simulating both the enthalpy and aerodynamic conditions over a range of Mach numbers in a flight trajectory. Aerojet performed freejet testing in the Pebble Bed facility at GASL as well as direct-connect testing at GASL. Aerojet also performed sea-level static (SLS) testing at the Aerojet A-Zone facility in Sacramento, CA. Several flight-type flowpath components were developed under the ART project. Aerojet designed and fabricated ceramic scramjet injectors. The structural design of the injectors will be tested in a simulated scramjet environment where thermal effects and performance will be assessed. Rocketdyne will be replacing the cooled combustor in the A5 rig with a flight-weight combustor that is near completion. Aerojet's formed duct panel is currently being fabricated and will be tested in the SLS rig in Aerojet's A-Zone facility. Aerojet has already successfully tested a cooled cowl panel in the same facility. In addition to MSFC, other NASA centers have contributed to the ART project as well. Inlet testing and parametrics were performed at NASA / Glenn Research Center (GRC) and NASA / Langley Research Center (LaRC) for both the Aerojet and Rocketdyne concepts. LaRC conducted an Air-Breathing Launch Vehicle (ABLV) study for several vehicle concepts with RBCC propulsion systems. LaRC is also performing a CFD analysis of the ramjet mode for both flowpaths based on GASL test conditions. A study was performed in 1999 to investigate the feasibility of performing an RBCC flight test on the NASA / Dryden Flight Research Center (DFRC) SR-71 aircraft. Academia involvement in the ART project includes parametric RBCC flowpath testing by Pennsylvania State University (PSU). In addition to thrust and wall static pressure measurements, PSU is also using laser diagnostics to analyze the flowfield in the test rig. MSFC is performing CFD analysis of the PSU rig at select test conditions for model baseline and validation. Also, Georgia Institute of Technology (GT) conducted a vision vehicle study using the Aerojet RBCC concept. Overall, the ART project has been very successful in advancing RBCC technology. Along the way, several major milestones were achieved and "firsts" accomplished. For example, under the ART project, the first dynamic trajectory simulation testing was performed and the Rocketdyne engine A5 logged over one hour of accumulated test time. The next logical step is to develop and demonstrate a flight-weight RBCC engine system.
Derived from text
Technology Assessment; Fabrication; Flight Simulation; Pressure Measurement; Rocket-Based Combined-Cycle Engines; Propulsion System Performance; Flow Distribution; Engine Tests

20010021224 NASA Marshall Space Flight Center, Huntsville, AL USA
Optimization of the SHX Fusion Powered Transatmospheric Propulsion Concept
Adams, Robert B., NASA Marshall Space Flight Center, USA; Landrum, D. Brian, Alabama Univ., USA; [2001]; 8p; In English; Aerospace Sciences, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Existing propulsion technology has not achieved cost effective payload delivery rates to low earth orbit. A fusion based propulsion system, denoted as the Simultaneous Heating and eXpansion (SHX) engine, has been proposed in earlier papers. The SHX couples energy generated by a fusion reactor to the engine flowpath by use of coherent beam emitters. A quasi-one-dimensional

flow model was used to quantify the effects of area expansion and energy input on propulsive efficiency for several beam models. Entropy calculations were included to evaluate the lost work in the system.
Author
Fusion Propulsion; Fusion Reactors; Aircraft Models; Jet Engines; Optimization

20010021321 NASA Marshall Space Flight Center, Huntsville, AL USA
Robust Low Cost Liquid Rocket Combustion Chamber by Advanced Vacuum Plasma Process
Holmes, Richard, NASA Marshall Space Flight Center, USA; Elam, Sandra, NASA Marshall Space Flight Center, USA; Ellis, David L., GRC, USA; McKechnie, Timothy, Plasma Processes, USA; Hickman, Robert, Plasma Processes, USA; [2001]; 1p; In English; TMS Meeting, 10-16 Feb. 2001, New Orleans, LA, USA
Contract(s)/Grant(s): NAS8-00110; CDDF-97-08; No Copyright; Avail: Issuing Activity; Abstract Only

Next-generation, regeneratively cooled rocket engines will require materials that can withstand high temperatures while retaining high thermal conductivity. Fabrication techniques must be cost efficient so that engine components can be manufactured within the constraints of shrinking budgets. Three technologies have been combined to produce an advanced liquid rocket engine combustion chamber at NASA-Marshall Space Flight Center (MSFC) using relatively low-cost, vacuum-plasma-spray (VPS) techniques. Copper alloy NARloy-Z was replaced with a new high performance Cu-8Cr-4Nb alloy developed by NASA-Glenn Research Center (GRC), which possesses excellent high-temperature strength, creep resistance, and low cycle fatigue behavior combined with exceptional thermal stability. Functional gradient technology, developed building composite cartridges for space furnaces was incorporated to add oxidation resistant and thermal barrier coatings as an integral part of the hot wall of the liner during the VPS process. NiCrAlY, utilized to produce durable protective coating for the space shuttle high pressure fuel turbo-pump (BPFTP) turbine blades, was used as the functional gradient material coating (FGM). The FGM not only serves as a protection from oxidation or blanching, the main cause of engine failure, but also serves as a thermal barrier because of its lower thermal conductivity, reducing the temperature of the combustion liner 200 F, from 1000 F to 800 F producing longer life. The objective of this program was to develop and demonstrate the technology to fabricate high-performance, robust, inexpensive combustion chambers for advanced propulsion systems (such as Lockheed-Martin's VentureStar and NASA's Reusable Launch Vehicle, RLV) using the low-cost VPS process. VPS formed combustion chamber test articles have been formed with the FGM hot wall built in and hot fire tested, demonstrating for the first time a coating that will remain intact through the hot firing test, and with no apparent wear. Material physical properties and the hot firing tests are reviewed.
Author
Combustion Chambers; Liquid Propellant Rocket Engines; Low Cost; Vacuum; Heat Resistant Alloys; Plasma Spraying

20010021342 NASA Marshall Space Flight Center, Huntsville, AL USA
Lightweight Chambers for Thrust Assemblies
Elam, Sandra K., NASA Marshall Space Flight Center, USA; Lee, Jonathan, NASA Marshall Space Flight Center, USA; Holmes, Richard, NASA Marshall Space Flight Center, USA; Zimmerman, Frank, NASA Marshall Space Flight Center, USA; Effinger, Mike, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 52nd; International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France
Contract(s)/Grant(s): NRA8-21; No Copyright; Avail: Issuing Activity; Abstract Only

The Marshall Space Flight Center (MSFC) of the National Aeronautics and Space Administration (NASA) has successfully applied new materials and fabrication techniques to create actively cooled thrust chambers that operate 200-400 degrees hotter and weigh 50% lighter than conventional designs. In some vehicles, thrust assemblies account for as much as 20% of the engine weight. So, reducing the weight of these components and increasing their operating range will benefit many engines and vehicle designs, including Reusable Launch Vehicle (RLV) concepts. Obviously, copper and steel alloys have been used successfully for many years in the chamber components of thrust assemblies. Yet, by replacing the steel alloys with Polymer Matrix Composite (PMC) and/or Metal Matrix Composite (MMC) materials, design weights can be drastically reduced. In addition, replacing the traditional copper alloys with a Ceramic Matrix Composite (CMC) or an advanced copper alloy (Cu-8Cr-4Nb, also known as GRCop-84) significantly increases allowable operating temperatures. Several small MMC and PMC demonstration chambers have recently been fabricated with promising results. Each of these designs included GRCop-84 for the cooled chamber liner. These units successfully verified that designs over 50% lighter are feasible. New fabrication processes, including advanced casting technology and a low cost vacuum plasma spray (VPS) process, were also demonstrated with these units. Hot-fire testing at MSFC is currently being conducted on the chambers to verify increased operating temperatures available with the GRCop-84 liner. Unique CMC chamber liners were also successfully fabricated and prepared for hot-fire testing. Yet, early results indicate these CMC liners need significantly more development in order to use them in required chamber designs. Based on the successful efforts with the MMC and PMC concepts, two full size "lightweight" chambers are currently being designed and fabricated for hot-fire

testing at MSFC in 2001. These ”full size” chambers will be similar in size to those used on the X33 engine (RS2200). One will be fabricated with a MMC structural jacket, while the other uses a PMC jacket. Each will be designed for thrust levels of 15,000 pounds in an oxygen/hydrogen environment with liquid hydrogen coolant. Both chambers will use GRCop-84 for its channel wall liner. Each unit is expected to be at least 60% lighter than a conventional design with traditional materials. Hot-fire testing on the full size units in late 2001 will directly compare performance results between a conventional chamber design and these ”lightweight” alternatives. The technology developed and demonstrated by this effort will not only benefit next generation RLV programs, but it can be applied to other existing and future engine programs, as well. Efforts were sponsored by the Advanced Space Transportation Program for RLV Focused Technologies. The task team was led by MSFC with additional members from NASA-Glenn Research Center and the Rocketdyne Division of The Boeing Company. Specific materials development and fabrication processes were provided by Aerojet, Lockheed Martin Astronautics, Composite Optics, Inc., Hyper-Therm, Ceramic Composites, Inc., MSE Technology Applications, and Plasma Processes, Inc.
Author
Technology Assessment; Fabrication; Ceramic Matrix Composites; Copper Alloys; Metal Matrix Composites; Polymer Matrix Composites; Technology Utilization; Thrust Chambers

20010021606 Engineering Research and Consulting, Inc., Edwards AFB, CA USA
SUPREM-DSMC: A New Scalable, Parallel, Reacting, Multidimensional Direct Simulation Monte Carlo Flow Code
Campbell, David, Engineering Research and Consulting, Inc., USA; Wysong, Ingrid, Air Force Research Lab., USA; Kaplan, Carolyn, Naval Research Lab., USA; Mott, David, Naval Research Lab., USA; Wadsworth, Dean, Engineering Research and Consulting, Inc., USA; VanGilder, Douglas, Engineering Research and Consulting, Inc., USA; JANNAF 25th Exhaust Plume Technology Subcommittee and 7th SPIRITS User Group Joint Meeting; May 2000; Volume 1, pp. 53-60; In English; 25th; 7th; Exhaust Plume Technology Subcommittee, 15-18 May 2000, Las Vegas, NV, Las Vegas, NV, USA, USA; Sponsored by NASA, USA
Contract(s)/Grant(s): F04611-99-C-0025; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

An AFRL/NRL team has recently been selected to develop a scalable, parallel, reacting, multidimensional (SUPREM) Direct Simulation Monte Carlo (DSMC) code for the DoD user community under the High Performance Computing Modernization Office (HPCMO) Common High Performance Computing Software Support Initiative (CHSSI). This paper will introduce the JANNAF Exhaust Plume community to this three-year development effort and present the overall goals, schedule, and current status of this new code.
Author
Monte Carlo Method; Computerized Simulation; Computer Systems Design; Software Engineering

20010021607 NASA Marshall Space Flight Center, Huntsville, AL USA
X-33 Pre-Flight Convective Base Thermal Environments Using Short Duration Test Techniques
D’Agostino, Mark, NASA Marshall Space Flight Center, USA; Seaford, C. Mark, NASA Marshall Space Flight Center, USA; Bender, Robert, Qualis Corp., USA; Engel, Carl, Qualis Corp., USA; JANNAF 25th Exhaust Plume Technology Subcommittee and 7th SPIRITS User Group Joint Meeting; May 2000; Volume 1, pp. 43-52; In English; 25th; 7th; Exhaust Plume Technology Subcommittee, 15-18 May 200, Las Vegas, NV, Las Vegas, NV, USA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

An innovative base-heating model has been used in a series of tests to obtain data for the X-33 linear aerospike base configuration. The model was a 2.25% external replication of the aft third of the X-33 configuration. The base environment was produced when the combustion products of a short duration firing of gaseous hydrogen-oxygen in a central combustor were expelled out of twenty top and twenty bottom nozzles directed along the linear aerospike plug. The model utilized gaseous hydrogen and oxygen fuel at mixture ratios and chamber pressures expected during X-33 flights. The testing simulated flight altitudes from sea level to 100,000 feet. Platinum thin film gages were used to collect convective heat transfer data and rapid response Kulite pressure transducers were used to collect external pressure data. The tests were performed in the Marshall Space Flight Center’s Nozzle Test Facility (NTF). Ascent plume induced convective base thermal environments were measured at locations on the scaled model corresponding to full scale vehicle flight test instrumentation locations. The environmental data were correlated in a form suitable for scaling to flight.
Author
X-33 Reusable Launch Vehicle; Base Heating; Convection; Aerospike Engines; Rocket Exhaust

20010021727 NASA Glenn Research Center, Cleveland, OH USA

Mean Line Pump Flow Model in Rocket Engine System Simulation

Veres, Joseph P., NASA Glenn Research Center, USA; Lavelle, Thomas M., NASA Glenn Research Center, USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 121-127; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A mean line pump flow modeling method has been developed to provide a fast capability for modeling turbopumps of rocket engines. Based on this method, a mean line pump flow code PUMPA has been written that can predict the performance of pumps at off-design operating conditions, given the loss of the diffusion system at the design point. The pump code can model axial flow inducers, mixed-flow and centrifugal pumps. The code can model multi-stage pumps in series. The code features rapid input setup and computer run time, and is an effective analysis and conceptual design tool. The map generation capability of the code provides the map information needed for interfacing with a rocket engine system modeling code. The off-design and multi-stage modeling capabilities of the code permit parametric design space exploration of candidate pump configurations and provide pump performance data for engine system evaluation. The PUMPA code has been integrated with the Numerical Propulsion System Simulation (NPSS) code and an expander rocket engine system has been simulated. The mean line pump flow code runs as an integral part of the NPSS rocket engine system simulation and provides key pump performance information directly to the system model at all operating conditions.

Author

Axial Flow; Centrifugal Pumps; Multiphase Flow; Rocket Engines; Simulation; Systems Analysis; Systems Engineering; Computerized Simulation

20010021728 Boeing Co., Rocketdyne Propulsion and Power, Canoga Park, CA USA

Development of an Integrated Rocket Thrust Chamber Assembly Analysis and Design Toolkit (TCAT)

Farhangi, S., Boeing Co., USA; Beck, J., Boeing Co., USA; Darian, A., Boeing Co., USA; Haung, Y., Boeing Co., USA; Liang, P., Boeing Co., USA; Jensen, R., Boeing Co., USA; Sindir, M., Boeing Co., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 109-119; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

There are many individual computational tools and methods used to analyze and design components of a rocket engine thrust chamber assembly (TCA) 11,21. To analyze and design a thrust chamber assembly these tools are usually used in sequence while communication of information between these tools is usually done manually. Each component of a TCA is usually designed and optimized individually with limited considerations on system optimized design. This approach is often iterative and can be prone to error. Also at present, expert knowledge of each tool is required. The objective of this software development effort is to select, integrate and automate the best tools into an easy-to-use computational package, the Thrust Chamber Analysis Toolkit (TCAT). This tool will provide a seamless process to analyze and design all or individual components of a thrust chamber assembly. This paper describes the current status of the MAT software development. The selected component codes and their capabilities are briefly described. User and module interfaces and integration status are presented. MAT pre- and post-processing added options are presented and overall MAT capabilities are demonstrated with the results of sample cases. Ongoing and planned model validation efforts are also described. Finally, the MAT future plan options are discussed.

Author

Rocket Engines; Rocket Thrust; Software Development Tools; Systems Engineering; Thrust Chambers

20010021731 NASA Marshall Space Flight Center, Huntsville, AL USA

Experimental/Analytical Characteristics of the RBCC Rocket-Ejector Mode

Ruf, J., NASA Marshall Space Flight Center, USA; Lehman, M., Pennsylvania State Univ., USA; Pal, S., Pennsylvania State Univ., USA; Santoro, R. J., Pennsylvania State Univ., USA; West, J., NASA Marshall Space Flight Center, USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 55-63; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA

Contract(s)/Grant(s): NAS8-40890; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Experimental and complementary CFD results from the study of the rocket-ejector mode of a Rocket Based Combined Cycle (RBCC) engine are presented and discussed. The experiments involved systematic flowfield measurements in a two-dimensional, variable geometry rocket-ejector system. The rocket-ejector system utilizes a single two-dimensional, gaseous oxygen/gaseous hydrogen rocket as the ejector. to gain a thorough understanding of the rocket-ejector's internal fluid mechanic/combustion phe-

nomena, experiments were conducted with both direct-connect and sea-level static configurations for a range of rocket operating conditions. Overall system performance was obtained through global measurements of wall static pressure profiles, heat flux profiles and engine thrust, whereas detailed mixing and combustion information was obtained through Raman spectroscopy measurements of major species (oxygen, hydrogen, nitrogen and water vapor). The experimental results for both the direct-connect and sea-level static configurations are compared with CFD predictions of the flowfield.
Author
Computational Fluid Dynamics; Fluid Mechanics; Pressure Distribution; Rocket-Based Combined-Cycle Engines; Spacecraft Propulsion; Wall Pressure; Water Vapor

20010021734 General Applied Science Labs., Inc., Ronkonkoma, NY USA
THRSTER: A Three-Stream Ejector Ramjet Analysis and Design Tool
Chue, R. S., General Applied Science Labs., Inc., USA; Sabean, J., General Applied Science Labs., Inc., USA; Tyll, J., General Applied Science Labs., Inc., USA; Bakos, R. J., General Applied Science Labs., Inc., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 151-166; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA
Contract(s)/Grant(s): NASA Order H-29709-D; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

An engineering tool for analyzing ejectors in rocket based combined cycle (RBCC) engines has been developed. A key technology for multi-cycle RBCC propulsion systems is the ejector which functions as the compression stage of the ejector ramjet cycle. The THRee STream Ejector Ramjet analysis tool was developed to analyze the complex aerothermodynamic and combustion processes that occur in this device. The formulated model consists of three quasi-one-dimensional streams, one each for the ejector primary flow, the secondary flow, and the mixed region. The model space marches through the mixer, combustor, and nozzle to evaluate the solution along the engine. In its present form, the model is intended for an analysis mode in which the diffusion rates of the primary and secondary into the mixed stream are stipulated. The model offers the ability to analyze the highly two-dimensional ejector flowfield while still benefits from the simplicity and speed of an engineering tool. to validate the developed code, wall static pressure measurements from the Penn-State and NASA-ART RBCC experiments were used to compare with the results generated by the code. The calculated solutions were generally found to have satisfactory agreement with the pressure measurements along the engines, although further modeling effort may be required when a strong shock train is formed at the rocket exhaust. The range of parameters in which the code would generate valid results are presented and discussed.
Author
Aerothermodynamics; Ejectors; Propulsion System Configurations; Propulsion System Performance; Ramjet Engines; Rocket Exhaust; Rocket-Based Combined-Cycle Engines

23
CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see categories 24 through 29. For astrochemistry see category 90 Astrophysics.

20010019839 Lockheed Martin Corp., Technology Services Group, Las Vegas, NV USA
Integrity of VOA-Vial Seals
Schumacher, B. A.; Minnich, M. M.; Zimmerman, J. H.; Blasdell, J.; Sep. 2000; 64p; In English
Report No.(s): PB2001-101547; No Copyright; Avail: National Technical Information Service (NTIS)

Preservation of soil samples for the analysis of volatile organic compounds (VOCs) requires both the inhibition of VOC degradation and the restriction of vapor movement in or out of the sample container. Clear 40-ml glass VOA vials manufactured by the four major U.S. glass manufacturers were tested for seal integrity. Visual inspection revealed a various of imperfections ranging from small indentations, bumps, and scratches on vial threads or lips, through obvious defects, such as large indentations or grooves in the vial lips and chipped or broken glass. The aluminum plate vacuum test proved to be unreliable in identifying potentially leaky vials. The septa-seal vacuum test was conducted twice on the 80 selected vials. Results show that mean VOC concentrations after 14 days storage generally were within +/- 20% of the known concentration with a majority of the concentrations within +/- 15% of their known values. Only 1 vial lost VOCs and that was due to a large chip in the vial's lip and neck. These

findings indicate that the silicone septa are flexible enough to overcome most vial imperfections and form a complete seal against VOC loss.
NTIS
Volatile Organic Compounds; Containers; Seals (Stoppers); Inspection; Degradation; Soil Sampling; Leakage

20010020882 Department of the Navy, Washington, DC USA
Selective Metals Determination with Photoreversible Reagents
Collins, Greg E., Inventor; Oct. 27, 2000; 25p; In English
Patent Info.: Filed 27 Oct. 2000; US-Patent-Appl-SN-09,696,942
Report No.(s): AD-D019747; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
Photoreversible compounds are used as metal ion sensing reagents. Particularly, spiropyrans modified to incorporate a metal ion complexation site such as, 8-hydroxyquinoline, onto the backbone of the spiropyran, are used as the photoreversible metal ion sensing reagents. Partial least-squares discriminant analysis is used to differentiate among the metal ions in a solution.
DTIC
Metal Ions; Metals; Reagents; Patent Applications

20010020943 Universities Space Research Association, USA
All-Optical Logic Gates in Organic Materials
Adbeldayem, H. A., Universities Space Research Association, USA; Frazier, D. O., Universities Space Research Association, USA; Witherow, W., Universities Space Research Association, USA; Paley, M. S., Universities Space Research Association, USA; Penn, B., Universities Space Research Association, USA; Banks, E., Universities Space Research Association, USA; [2000]; 1p; In English, Unknown; Sponsored by Optical Society of America, USA
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only
A picosecond switch made of polydiacetylene thin film coated on the interior of a 50-micron diameter hollow fiber and a nanosecond switch made of a micron thick film of phthalocyanine on glass were developed.
Author
Gates (Circuits); Organic Materials; Switches; Thin Films; Optical Interconnects; Optoelectronic Devices; Optical Switching; Integrated Optics

20010021366 Osaka City Univ., Faculty of Engineering, Japan
Effects of Evaporation Condition on Luminous Characteristics of a Single Layer EL Device
Sunamia, Teppei, Osaka City Univ., Japan; Tanaka, Kenji, Osaka City Univ., Japan; Maekawa, Yoshiharu, Osaka City Univ., Japan; Kusabiraki, Minoru, Osaka City Univ., Japan; Aozasa, Masao, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 7-11; In English; Copyright; Avail: Issuing Activity
To fabricate a high-performance organic electroluminescent (EL) device, we investigated an effects of evaporation condition on luminous characteristics of a single layer EL device using organic material Alq3 (tris (8- quinolinato) aluminum complex). Lower base pressure and faster deposition rate of Alq3 resulted in higher maximum luminance of EL device.
Author
Organic Materials; Electroluminescence; Plasma Display Devices

24
COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20010020055 NASA Marshall Space Flight Center, Huntsville, AL USA
CTE Measurements of Carbon Fibers in ESEM
Effinger, Michael, NASA Marshall Space Flight Center, USA; Ochoa, Ozden, Texas A&M Univ., USA; [2001]; 1p; In English; 25th; Composites, Materials and Structures, 22-25 Jan. 2001, Cocoa Beach, FL, USA
Contract(s)/Grant(s): RTOP 708-72-41; No Copyright; Avail: Issuing Activity; Abstract Only
The strong appeal of carbon fiber reinforced ceramic matrix and carbon-carbon composites arises from their promising high temperature performance within laboratory-simulated nozzle, leading edge and combustor environments. The main drawback in these systems are two fold; namely oxidation affinity and CTE mismatch. to date the emphasis has been on axial CTE mismatch

with the push on estimating (component) laminate level data. However, in heterogeneous and anisotropic systems, all failure mechanisms are at micro or nano scales. This paper will report plans and progress on single carbon fibers efforts in order to develop its temperature dependent, anisotropic thermophysical and thermomechanical properties using combination of x-ray spectroscopy and environmental scanning electron microscopy to capture circumferential expansion from 20-900 C in within the SEM chamber. Surface roughness measurements were also determined. Crystallinity was also determined by the quality of the electron diffraction (ED) patterns.
Author
Carbon Fibers; Fiber Composites; Carbon-Carbon Composites; Reinforcing Fibers; Ceramic Matrix Composites

20010020075 NASA Marshall Space Flight Center, Huntsville, AL USA
Solid Free-Form Fabrication of Continuous Fiber Reinforced Composites for Propulsion Application
Vaidyanathan, R., Advanced Ceramics Research, Inc., USA; Walish, J., Advanced Ceramics Research, Inc., USA; Fox, M., Advanced Ceramics Research, Inc., USA; Rigali, M., Advanced Ceramics Research, Inc., USA; Sutaria, M., Advanced Ceramics Research, Inc., USA; Gillespie, John W., Jr., Delaware Univ., USA; Yarlagadda, Shridhar, Delaware Univ., USA; Effinger, Mike, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 25th; Composites, Materials and Structures, 22-25 Jan. 2001, Cocoa Beach, FL, USA
Contract(s)/Grant(s): RTOP 253-02-02; No Copyright; Avail: Issuing Activity; Abstract Only

For propulsion related applications, materials must be able to demonstrate excellent ablation and oxidation resistance at temperature approaching 3500 C, adequate load bearing capabilities, non-catastrophic failure modes, and ability to withstand transient thermal shock. A potential list of propulsion-material property requirements includes, low density, high elastic modulus, low thermal-expansion coefficient, high thermal conductivity, excellent erosion and oxidation/corrosion resistance, and flaw-insensitivity. In many cases, they will also need to be able to be joined, survive thermal cycling and multi-axial stress states, and for reusable applications, the materials must maintain the above attributes after prolonged exposure to extremely harsh chemical environments. The final and possibly most important attribute for these materials are the need to be lower cost and readily available in large quantities. Recently, Advanced Ceramics Research, Inc. (ACR) has developed low cost, flexible-manufacturing processes for Zr & Hf-based carbon fiber reinforced composites, materials with good oxidation and ablation resistance up to 3500 C. This process, called Continuous Composite Co-extrusion (C(sup 3)), incorporates carbon fibers to fabricate 'in-situ' carbide and boride-matrix/carbon fiber composites. M is a variation of ACR's manufacturing process for low-cost structural ceramic materials called Fibrous Monoliths with carbon fiber reinforcements. Fibrous Monolithic materials have a distinct fibrous texture, consist of intertwined cells of a primary phase, separated by cell boundaries of a tailored secondary phase and show very high fracture energies, damage tolerance, and graceful failure. Since they are monolithic powder based composites; they can be manufactured by conventional powder processing techniques using inexpensive raw materials. This combination of high performance and low cost is a breakthrough that could enable wider application of ceramics in high temperature applications. Typical volume fractions of the two phases are 80 to 95% for the cell phase and 5 to 20% for the interpenetrating cell boundary phase. ACR is currently developing an innovative solid freeform form fabrication (SFF) approach to produce Hf and Zr based ceramic composite components reinforced with continuous carbon fiber tows for critical structural components such as tubes and blisks. The process is simple, robust and will be widely applicable to a number of material systems. This technique was originally developed at the University of Delaware Center for Composite Materials (UD-CCM) for rapid fabrication of polymer matrix composites by a technique called automated tow placement or ATP. The current process is being developed in collaboration with UD-CCM. The paper will detail the freeform fabrication process to create low-cost ceramic fiber reinforced composites for high-temperature applications. The results of mechanical properties and microstructural characterization will be presented, together with examples of complex shapes and parts. It is believed that the process will be able to create complex shaped parts for propulsion applications at an order of magnitude lower cost than current CVI and PIP processes.
Author
Composite Materials; Fiber Composites; Forming Techniques; Fabrication; Ablation

20010020091 NASA Langley Research Center, Hampton, VA USA
Automated Fiber Placement of PEEK/IM7 Composites with Film Interleaf Layers
Hulcher, A. Bruce, Old Dominion Univ., USA; Banks, William I., III, Old Dominion Univ., USA; Pipes, R. Byron, Old Dominion Univ., USA; Tiwari, Surendra N., Old Dominion Univ., USA; Cano, Roberto J., NASA Langley Research Center, USA; Johnston, Norman J., NASA Langley Research Center, USA; [2001]; 15p; In English; Science of Advanced Materials and Process Engineering Series, 6-10 May 2001, Long Beach, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The incorporation of thin discrete layers of resin between plies (interleafing) has been shown to improve fatigue and impact properties of structural composite materials. Furthermore, interleafing could be used to increase the barrier properties of compos-

ites used as structural materials for cryogenic propellant storage. In this work, robotic heated-head tape placement of PEEK/IM7 composites containing a PEEK polymer film interleaf was investigated. These experiments were carried out at the NASA Langley Research Center automated fiber placement facility. Using the robotic equipment, an optimal fabrication process was developed for the composite without the interleaf. Preliminary interleaf processing trials indicated that a two-stage process was necessary; the film had to be tacked to the partially-placed laminate then fully melted in a separate operation. Screening experiments determined the relative influence of the various robotic process variables on the peel strength of the film-composite interface. Optimization studies were performed in which peel specimens were fabricated at various compaction loads and roller temperatures at each of three film melt processing rates. The resulting data were fitted with quadratic response surfaces. Additional specimens were fabricated at placement parameters predicted by the response surface models to yield high peel strength in an attempt to gage the accuracy of the predicted response and assess the repeatability of the process. The overall results indicate that quality PEEK/lM7 laminates having film interleaves can be successfully and repeatability fabricated by heated head automated fiber placement.
Author
PEEK; Composite Materials; Fabrication; Polymer Matrix Composites; Fiber Composites; Interlayers

20010020209 Lockheed Martin Michoud Space Systems, New Orleans, LA USA
Oxygen Compatibility Testing of Composite Materials
Graf, Neil A., Lockheed Martin Michoud Space Systems, USA; Hudgins, Richard J., Lockheed Martin Michoud Space Systems, USA; McBain, Michael, Lockheed Martin Michoud Space Systems, USA; [2000]; 12p; In English; 32nd, 5-9 Nov. 2000, Boston, MA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA
Contract(s)/Grant(s): NCC8-115; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The development of polymer composite liquid oxygen LO2 tanks is a critical step in creating the next generation of launch vehicles. Future launch vehicles need to minimize the gross liftoff weight (GLOW), which is possible due to the 25%-40% reduction in weight that composite materials could provide over current aluminum technology. Although a composite LO2 tank makes these weight savings feasible, composite materials have not historically been viewed as ”LO2 compatible.” to be considered LO2 compatible, materials must be selected that will resist any type of detrimental, combustible reaction when exposed to usage environments. This is traditionally evaluated using a standard set of tests. However, materials that do not pass the standard tests can be shown to be safe for a particular application. This paper documents the approach and results of a joint NASA/Lockheed Martin program to select and verify LO2 compatible composite materials for liquid oxygen fuel tanks. The test approach developed included tests such as mechanical impact, particle impact, puncture, electrostatic discharge, friction, and pyrotechnic shock. These tests showed that composite liquid oxygen tanks are indeed feasible for future launch vehicles.
Author
Polymer Matrix Composites; Liquid Oxygen; Tanks (Containers); Liquid Filled Shells

20010020226 NASA Marshall Space Flight Center, Huntsville, AL USA
Assessment of The Compatibility of Composite Materials With High-Test Hydrogen Peroxide
Gostowski, Rudy, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 3rd; Hydrogen Peroxide Propulsion, 12 Nov. 2000, Gulfport, MS, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The compatibility of composite materials with high-test hydrogen peroxide (HTP) was assessed using various chemical and mechanical techniques. Methods included classical schemes combining concentration assay with accelerated aging by means of a heated water bath. Exothermic reactivity was observed using Isothermal Microcalorimetry. Mechanical Properties testing determined degradation of the composite material. Photoacoustic Infrared Spectroscopy was used to monitor chemical alteration of the resin matrix. Other materials were examined including some polymers and metals.
Author
Compatibility; Composite Materials; Hydrogen Peroxide

20010020228 Lockheed Martin Michoud Space Systems, New Orleans, LA USA
LH2 Tank Composite Coverplate Development and Flight Qualification for the X-33
Wright, Richard J., Lockheed Martin Michoud Space Systems, USA; Roule, Gerard M., Lockheed Martin Michoud Space Systems, USA; [2000]; 9p; In English; 32nd; SAMPE International Technical Conference, 5-9 Nov. 2000, Boston, MA, USA
Contract(s)/Grant(s): NCC8-115; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this paper, the development history for the first cryogenic pressurized fuel tank coverplates is presented along with a synopsis of the development strategy and technologies which led to success on this program. Coverplates are the large access panels used to access launch vehicle fuel tanks. These structures incorporate all of the requirements for a pressure vessel as well as the added requirement to mount all of the miscellaneous access points required for a fuel management system. The first composite

coverplates to meet the requirements for flight qualification were developed on the X-33 program. The X-33 composite coverplates went from an open requirement to successful finished flight hardware with multiple unique configurations, complete with verification testing, in less than eighteen months. Besides the rapid development schedule, these components introduced several new technologies previously unseen in cryogenic composites including solutions to cryogenic shrinkage, self-supporting sealing surfaces, and highly loaded composite bosses with precision sealing interfaces. These components were proven to seal liquid hydrogen at cryogenic temperatures under maximum loading and pressure conditions.
Author
Cryogenic Fluid Storage; Fuel Tanks; Panels

20010020230 Boeing Aerospace Co., Kent, WA USA
Analysis of Ag/FEP Thermal Control Blanket Performance From Multiple Satellites
Pippin, Gary, Boeing Aerospace Co., USA; Normand, E., Boeing Aerospace Co., USA; Woll, S., Boeing Aerospace Co., USA; [2001]; 15p; In English; 39th; Aerospace Sciences, Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS8-98213; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Materials performance data from operational spacecraft and spacecraft experiments has slowly accumulated over the years. Much of this data is obtained indirectly by analyzing temperature measurements telemetered to ground. Due to the Space Transportation System (STS) program, materials performance data has also been obtained by flying materials on satellites, or on the Space Shuttle itself, for limited periods of time, and then returning the materials to ground for post-flight examination. During the course of NASA contract NAS8-98213, the authors have extended the analysis of data reported for selected materials flown on a variety of spacecraft over the past 30 years. In this paper we discuss changes in two properties of silver- or aluminum-backed (metallized) FEP Teflon due to exposure to specific environmental factors on-orbit. First, the change in solar absorptance (alpha(sub s)) of metallized FEP Teflon as a function of particulate radiation will be discussed. Data providing the change in solar absorptance of metallized FEP as a function of days on orbit has been published for NTS-2 satellite, several NavStar Global Positioning Satellites (GPS), the SCATHA experiment, and the ML-101 satellite. The unique approach that we have taken is to calculate the absorbed radiation dose within the Ag/FEP for the various satellite orbits, and to plot the change in solar absorptance, alpha(sub s), as a function of the dose; the behavior agrees with the same data from laboratory tests. Second, the variation of the atomic oxygen induced material recession rate of metallized FEP will be discussed. Data from certain Space Shuttle flights, a Lockheed experiment [approximately 105 days in low Earth orbit (LEO)], and the Long Duration Exposure Facility allows the variation of the material recession rate of Ag/FEP to be estimated under conditions that include atomic oxygen exposure.
Derived from text
Temperature Control; Temperature Measurement; Performance Tests; Global Positioning System; Long Duration Exposure Facility; Navstar Satellites; Navigation Technology Satellites; Scatha Satellite

20010020231 Lockheed Martin Michoud Space Systems, USA
Emerging Composite Technologies
Wright, R., Lockheed Martin Michoud Space Systems, USA; [2000]; 20p; In English; 4th; Aerospace Materials, Processes and Environmental Technology, 18-20 Sep. 2000, Huntsville, AL, USA
Contract(s)/Grant(s): NCC*-115; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this presentation is to discuss the external tank composite applications, and composite development as it relates to the the cryogenic tankage, composite repair, cryogenic feedlines, and LO2 compatible composites.
CASI
External Tanks; Composite Propellants; Propellant Additives; Propellant Tanks

20010020264 NASA Langley Research Center, Hampton, VA USA
Damage Progression in Buckle-Resistant Notched Composite Plates Loaded in Uniaxial Compression
McGowan, David M., NASA Langley Research Center, USA; Davila, Carlos G., NASA Langley Research Center, USA; Ambur, Damodar R., NASA Langley Research Center, USA; Apr. 19, 2001; 20p; In English; 42nd; AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, 16-19 Apr. 2001, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2001-1482; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results of an experimental and analytical evaluation of damage progression in three stitched composite plates containing an angled central notch and subjected to compression loading are presented. Parametric studies were conducted systematically to identify the relative effects of the material strength parameters on damage initiation and growth. Comparisons with experiments

were conducted to determine the appropriate in situ values of strengths for progressive failure analysis. These parametric studies indicated that the in situ value of the fiber buckling strength is the most important parameter in the prediction of damage initiation and growth in these notched composite plates. Analyses of the damage progression in the notched, compression-loaded plates were conducted using in situ material strengths. Comparisons of results obtained from these analyses with experimental results for displacements and axial strains show good agreement.
Author
Damage; Displacement; Failure Analysis; Composite Materials; Plates (Structural Members)

20010020368 Minnesota Univ., Office of Research and Technology Transfer Administration, Minneapolis, MN USA
AASERT: Research Training in Anaysis, Design, and Computation of Active Materials ***Final Report, 1 Jul. 1996-30 Jun. 1999***
Luskin, Mitchell; James, Richard; Sep. 10, 1999; 3p; In English
Contract(s)/Grant(s): F49620-96-1-0212
Report No.(s): AD-A385457; AFRL-SR-BL-TR-00-0692; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The graduate students supported by this AASERT obtained research training in the application of mathematical modelling, analysis and computation to the improvement of active materials. The central focus of this work was on the development of specific strategies to improve present materials and on the design of new materials and composites. Rob Tickle studied a promising alloy system Ni-Mn-Ga for the presence of magneto-memory and obtained reversible strains that are currently the largest field-induced strains that have been observed under moderate field. James Riordan developed a piecewise linear nonconforming finite element method for the computation of microstructure in martensitic active materials. Tim Brule worked on the development and analysis of numerical algorithms to compute the deformation of thin martensitic films for application in microvalves, micropumps, or other micromachines.
DTIC
Composite Materials; Research and Development; Finite Element Method; Martensite; Deformation; Algorithms; Alloys

20010020398 NASA Marshall Space Flight Center, Huntsville, AL USA
X-33 LH2 Tank Failure Investigation Findings
Niedermeyer, Mindy, NASA Marshall Space Flight Center, USA; [2000]; 30p; In English; Aerospace Materials, Processes and Environmental Technology, 18-20 Sep. 2000, Huntsville, AL, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This presentation focuses on the tank history, test objectives, failure description, investigation and conclusions. The test objectives include verify structural integrity at 105% expected flight load limit varying the following parameters: cryogenic temperature; internal pressure; and mechanical loading. The Failure description includes structural component of the aft body, quad-lobe design, and sandwich - honeycomb graphite epoxy construction.
CASI
X-33 Reusable Launch Vehicle; Liquid Hydrogen; Cryogenic Rocket Propellants; Cryogenic Fluid Storage; Structural Analysis; Structural Failure

20010020418 Michigan State Univ., East Lansing, MI USA
Role of ERa Splicing Variants in Regulation of AP-1 Directed Gene Transcription in Breast Cancer Cells ***Annual Report, 1 Jun. 1999 - 31 May 2000***
Bollig, Aliccia; Miksicek, Richard J.; Jun. 2000; 26p; In English
Contract(s)/Grant(s): DAMD17-99-1-9293
Report No.(s): AD-A385732; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents recently published results from biochemical analysis of estrogen receptor (ER) -alpha mRNA splicing variants (Molecular Endocrinology 14: 634-649, May 2000). Although most of the variants appear to be functionally impaired, analysis of two receptor isoforms demonstrates that they retain many of the activities of wild-type ER-alpha, including protein-protein interaction, DNA binding, ligand binding and nuclear localization. These results and additional unpublished results from reporter gene studies suggest that ER-alpha variants can positively regulate gene transcription by a non-classical mechanism. None of the variants examined activate a consensus estrogen response element (ERE). However, specific ER-alpha variants activate the promoters of some genes that are estrogen regulated even though they lack an ERE.
DTIC
Estrogens; Mammary Glands; Splicing; Cancer; Chemical Analysis; Receptors (Physiology)

20010020772

Statistical and scaling properties of the ac conductivity in thin metal-dielectric composites

Zekri, L.; Zekri, N.; Bouamrane, R.; Brouers, F.; Aug. 31, 1998; 18p; In English

Report No.(s): DE99-606818; IC-98/117; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We study in this paper the scaling and statistical properties of the ac conductivity of thin metal-dielectric films in different regions of the loss in metallic components and particularly in the limit of vanishing loss. We model the system by a 2D RL-C network and calculate the effective conductivity by using a real space renormalization group method. It is found that the real conductivity strongly fluctuates for very small losses. The correlation length, which seems to be equivalent to the localization length, diverges for vanishing losses confirming our previous results for the decay of the real conductivity with the loss. We also found that the distribution of the real conductivity becomes log-normal below a certain critical loss R(sub c) which is size dependent for finite systems. For infinite systems this critical loss vanishes and corresponds to the phase transition between localized modes for finite losses and the extended ones at zero loss.

NTIS

Statistical Distributions; Scaling Laws; Thin Films

20010020778

NMR study of hydrated calcium silicates

Klur, I.; Feb. 26, 1996; 166p; In French; In English

Report No.(s): DE99-606807; FRCEA-TH-645; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Radioactive wastes storage methods are developed by the CEA. As cements are important materials as well for hours living radioisotopes than for years living radioisotopes, a better knowledge of this material will allow to anticipate its behaviour and to obtain safer storage methods. The structure of calcium silicates (C-S-H) (main constituent of cements) have then been determined in this thesis by nuclear magnetic resonance. This method has allow to explain in structural terms, the different calcium rates that can be measured in the C-S-H too.

NTIS

Nuclear Magnetic Resonance; Calcium Silicates; Crystal Structure

20010020877 Northwestern Univ., Evanston, IL USA

System Design of Hierarchically Structured Materials ***Final Report, 1 Sep. 1996 - 30 Jun. 2000***

Olson, Gregory B.; Nov. 27, 2000; 55p; In English; Original contains color plates

Contract(s)/Grant(s): DAAH04-96-1-0266

Report No.(s): AD-A385760; ARO-35743.4-MS; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Research extended the Steel Research Group (SRG) systems design approach to more complex materials by establishing methodology and fundamental principles for rational design of higher levels of structural hierarchy, while incorporating increased dynamic character in the form of adaptive system concepts via synergistic integration of materials science and applied mechanics. Research addressed both the methodology of rational design at new levels of materials complexity, and the fundamental principles of specific materials behaviors necessary to support quantitative design. This included principles of microstructural evolution during coherent carbide precipitation for efficient strengthening without embrittlement, control of metastable austenite precipitation for optimal-stability transformation toughening, behavior of pseudoelastic crack-bridge toughening, and shape-memory-based healing of internal composite damage. Exploratory research also addressed conceptual design of multifunctional metal/ceramic hybrid armor systems, and transformation-plasticity based matrix alloys for shearable tungsten heavy alloy composites.

DTIC

Systems Engineering; Composite Materials; High Strength Alloys

20010020948 NASA Marshall Space Flight Center, Huntsville, AL USA

Permeability Testing of Impacted Composite Laminates for Use on Reusable Launch Vehicles

Nettles, A. T., NASA Marshall Space Flight Center, USA; February 2001; 26p; In English

Report No.(s): NASA/TM-2001-210799; M-1001; NAS 1.15:210799; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Since composite laminates are beginning to be identified for use in reusable launch vehicle propulsion systems, an understanding of their permeance is needed. A foreign object impact event can cause a localized area of permeability (leakage) in a polymer matrix composite, and it is the aim of this study to assess a method of quantifying permeability-after-impact results. A simple test apparatus is presented, and variables that could affect the measured values of permeability-after-impact were assessed. Once it was determined that valid numbers were being measured, a fiber/resin system was impacted at various impact levels and

the resulting permeability measured, first with a leak check solution (qualitative) then using the new apparatus (quantitative). The results showed that as the impact level increased, so did the measured leakage. As the pressure to the specimen was increased, the leak rate was seen to increase in a nonlinear fashion for almost all the specimens tested.
Author
Laminates; Leakage; Permeability; Microcracks; Impact Tests

20010021083
Report on the R and D of nonlinear optoelectronic materials, *FY 1997*
Mar. 31, 1998; 464p; In Japanese
Report No.(s): DE99-707603; ETDE/JP-99707603; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

As to the development of organic base materials, the paper is going ahead with an evaluation, higher performance and further use as materials of basic optical properties of quirale nonlinear materials and organic conjugate base materials which are promising among organic low molecular materials. As the development of orientation control crystal growth technology, grooves for orientation control were formed on the surface of the lead glass substrate, from which thin film single crystals were obtained. The nonlinear response was studied of the glass where semiconducting fine particles dispersed in matrix glass. Glass scattering base prototype materials were selected by the sol-gel method and ultra-low melting-point glass method. The glass dispersion base materials by the very fast cooling method was also studied. For the purpose of realizing a high speed switching characteristic, a processing technology was developed of ultra fine particle dispersing polymer light waveguide. As to the technology for super lattice, the optimum nonlinear performance materials were selected mainly with the optimum complex super lattice base. Moreover, the three-dimensional super structuring technology was constructed to improve nonlinear optical characteristics. The comprehensive investigational study was conducted for effective promotion of the research development.
NTIS
Optical Properties; Organic Materials; Optical Materials

20010021111 North Carolina Agricultural and Technical State Univ., Dept. of Mechanical Engineering, Greensboro, NC USA
Approaches to Design and Evaluation of Sandwich Composites *Final Report, 15 Jun. 1997 - 31 Oct. 2000*
Shivakumar, Kunigal, North Carolina Agricultural and Technical State Univ., USA; Feb. 16, 2001; 33p; In English
Contract(s)/Grant(s): N00014-99-0445; NAG1-1956; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes research during the period June 15, 1997 to October 31, 2000. This grant yielded a low cast manufacturing of composite sandwich structures technology and characterization interfacial and subinterfacial cracks in foam core sandwich panels. The manufacturing technology is called the vacuum assisted resin transfer (VARTM). The VARTM is suitable for processing composite materials both at ambient and elevated temperatures and of unlimited component size. This technology has been successfully transferred to a small business fiber preform manufacturing company 3TEX located in Cary, North Carolina. The grant also supported one Ph.D, one M.S and a number of under graduate students, and nine publications and Presentations.
Author
Composite Structures; Sandwich Structures; Mechanical Properties; Structural Design

20010021180 NASA Marshall Space Flight Center, Huntsville, AL USA
Metal Matrix Composite LOX Turbopump Housing Via Novel Tool-Less Net-Shape Pressure Infiltration Casting Technology
Shah, Sandeep, NASA Marshall Space Flight Center, USA; Lee, Jonathan, NASA Marshall Space Flight Center, USA; Bhat, Biliyar, NASA Marshall Space Flight Center, USA; Wells, Doug, NASA Marshall Space Flight Center, USA; Gregg, Wayne, NASA Marshall Space Flight Center, USA; Marsh, Matthew, NASA Marshall Space Flight Center, USA; Genge, Gary, NASA Marshall Space Flight Center, USA; Forbes, John, NASA Marshall Space Flight Center, USA; Salvi, Alex, Metal Matrix Cast Composites, Inc., USA; Cornie, James A., Metal Matrix Cast Composites, Inc., USA; Sung, Michael, Metal Matrix Cast Composites, Inc., USA; Zhang, Shi-Yu, Metal Matrix Cast Composites, Inc., USA; [2001]; 4p; In English; Aeromat, 11-14 Jun. 2001, Long Beach, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Metal matrix composites (MMC) offer relatively higher specific strength, specific stiffness, lower coefficient of thermal expansion (CTE) and lower density as compared with conventional alloys. These unique properties make them very attractive for aerospace turbomachinery applications where there is ever increasing emphasis to reduce weight and cost, and to increase engine performance. Through a joint effort between NASA and Metal Matrix Cast Composites, Inc., a complex liquid oxygen (LOX) compatible turbopump housing is being redesigned and manufactured from hybrid (particulate and fibers) Aluminum MMC. to this end, a revolutionary tool-less pressure infiltration casting technology is being perfected. Ceramic preforms for the composite are 3-dimensionally printed using a stereolithography file, acquired from a CAD model. The preforms are then invested

into a refractory material and pressure infiltrated with liquid metal. After casting, the refractory material is washed away leaving behind a near net-shape composite part. Benefits of this process include increased composite uniformity, no mold machining, short time from design to part, properties matching traditional methods, ability to make previously impossible to manufacture parts and no size limitations with a newly developed joining technology. The results of materials, manufacturing and design optimizations, preform joining, and sub-element tests will be presented.
Author
Casting; Liquid Oxygen; Metal Matrix Composites; Housings; Aluminum; Infiltration

20010021216 Alabama Univ., Dept. of Civil and Environmental Engineering, Huntsville, AL USA
Quantifying Void Ratio in Granular Materials Using Voronoi Tessellation
Alshibli, Khalid A., Alabama Univ., USA; El-Saidany, Hany A., Qualcomm, Inc., USA; [2000]; 1p; In English
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

Voronoi technique was used to calculate the local void ratio distribution of granular materials. It was implemented in an application-oriented image processing and analysis algorithm capable of extracting object edges, separating adjacent particles, obtaining the centroid of each particle, generating Voronoi polygons, and calculating the local void ratio. Details of the algorithm capabilities and features are presented. Verification calculations included performing manual digitization of synthetic images using Oda's method and Voronoi polygon system. The developed algorithm yielded very accurate measurements of the local void ratio distribution. Voronoi tessellation has the advantage, compared to Oda's method, of offering a well-defined polygon generation criterion that can be implemented in an algorithm to automatically calculate local void ratio of particulate materials.
Author
Granular Materials; Algorithms; Digital Techniques; Image Analysis; Porosity; Size Distribution; Void Ratio

20010021265 NASA Marshall Space Flight Center, Huntsville, AL USA
Metal Nanoparticle Aerogel Composites
Smith, David D., NASA Marshall Space Flight Center, USA; Sibille, Laurent, NASA Marshall Space Flight Center, USA; Ignont, Erica, NASA Marshall Space Flight Center, USA; Snow, Lanee, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 6th; Aerogels, 9 Oct. 2000, Albuquerque, NM, USA; Copyright; Avail: Issuing Activity; Abstract Only

We have fabricated sol-gels containing gold and silver nanoparticles. Formation of an aerogel produces a blue shift in the surface plasmon resonance as a result of the decrease in the dielectric constant of the matrix upon supercritical extraction of the solvent. However, as a result of chemical interface damping this blue shift does not obey effective medium theories. Annealing the samples in a reducing atmosphere at 400 C eliminates this discrepancy and results in narrowing and further blue shifting of the plasmon resonance. Metal particle aggregation also results in a deviation from the predictions of effective medium theories, but can be controlled through careful handling and by avoiding the use of alcohol. by applying effective medium theories to the heterogeneous interlayer surrounding each metal particle, we extend the technique of immersion spectroscopy to inhomogeneous materials characterized by spatially dependent dielectric constants, such as aerogels. We demonstrate that the shift in the surface plasmon wavelength provides the average fractional composition of each component (air and silica) in this inhomogeneous layer, i.e. the porosity of the aerogel or equivalently, for these materials, the catalytic dispersion. Additionally, the kinetics suggest that collective particle interactions in coagulated metal clusters are perturbed during silica gelation resulting in a change in the aggregate geometry.
Author
Aerogels; Nanocomposites; Fabrication; Gold; Silver; Metal Clusters

20010021545 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA
Repair of Composite Laminates *Final Report*
Ahn, S. H.; Springer, G. S.; Dec. 2000; 94p; In English
Report No.(s): PB2001-102638; Copyright; Avail: National Technical Information Service (NTIS)

The effectiveness of repair of damaged fiber reinforced composite laminates was investigated; the effectiveness of repair being assessed by the tensile failure load of the repaired laminate. First, tests were conducted measuring the failure loads of laminates repaired either by the scarf, the uniform lap, or the stepped lap technique. Data were generated with the following parameters having been varied: type of material of the damaged laminate, type of repair material, scarf angle and number of external plies in scarf repair, length and number repair plies in uniform and stepped lap repair, moisture content of the laminate prior to repair, moisture content of the laminate after repair, test temperature, roughness of grinding tool used in preparing the repair surface, and the temperature applied during the cure of the repair patch. The aforementioned parameters were varied over wide ranges, and provided systematic sets of data which shed light on the influence of each of these parameters on the effectiveness of the repair.

Second, models were developed for calculating the failure loads of composite laminates repaired by scarf and uniform lap techniques. The models take into account anisotropy of each ply in the laminate and in the repair ply and nonelastic behavior of the adhesive or resin interlayer between the laminate and the repair patch.
NTIS
Laminates; Reinforcing Fibers; Fiber Composites; Maintenance; Failure Analysis; Mathematical Models; Loads (Forces)

20010021558 Defence Science and Technology Organisation, Melbourne Australia
Environmental Exposure of Boron-Epoxy Composite Material
Vodicka, Roger; Oct. 2000; 24p; In English
Report No.(s): AD-A385731; DSTO-TN-0309; DODA-AR-011-602; Copyright; Avail: Issuing Activity

Boron-epoxy composite material (Textron 5521 F/4) was exposed at two tropical exposure sites within Australia for a period of about 3.5 years to evaluate the effects of outdoor exposure on mechanical properties. Specimens were exposed to three exposure types; fully exposed, covered and shaded. Moisture contents of 0.85% at Tindal N.T and 1.07% at AMRL-Q, Innisfail, QLD were found after about 3.5 years for the shaded and covered exposure conditions. Fully exposed specimens had about 20% less moisture. Mechanical tests were then performed in +/- 45 deg in-plane shear at both room temperature and 60 C to assess the effects of moisture on the matrix. The chord shear modulus was also determined in some cases. The results indicated that no significant changes in shear strength occurred at room temperature or 60 C due to outdoor exposure. The peak shear stress is about 15% lower when tested at 60 C compared to those tested at room temperature. The chord shear modulus values were subject to scatter but did not reveal any deterioration in material performance. An accelerated laboratory conditioning scheme to produce a 1% moisture level in the composite was also devised which allowed an equilibrium moisture level to be established in eight ply boron-epoxy specimens after only six weeks. This study found no evidence that absorbed moisture is likely to degrade the strength of boron-epoxy repair patches used on RAAF aircraft when tested at room temperature and 60 C.
DTIC
Exposure; Boron-Epoxy Composites

25
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also 34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics.

20010019841 National Inst. of Standards and Technology, (BFRL), Gaithersburg, MD USA
Meeting of the UJNR Panel on Fire Research and Safety (15th)
Bryner, S. L.; Nov. 2000; 206p; In English
Report No.(s): PB2001-101517; NISTIR-6588-V2; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Post-earthquake fires are considered to be one of the important factors that enlarge the damage when a densely inhabited urban area is hit by a severe earthquake. It will be necessary to effectively mitigate the damage caused by such post-earthquake fires. Several models are already available in Japan for the purpose of predicting the fire spread in urban areas. It can be said that these models were developed based on the model so-called 'Hamada formula,' which was introduced by Hamada, Emeritus of University of Tokyo more than 50 years ago. The Hamada model was constructed mainly based on the statistical data on the spread of the urban fires in the past, which frequently burned Japanese cities into ashes, as a function of wind velocity. However, now that the conditions of the cities, including building materials and constructions, have extremely changed, it is doubtful that the validity of the statistically-based model still remains. It is considered to be necessary to develop a physically-based model for the better assessment of the post-earthquake fire loss in modern cities. In this study, a model for predicting fire spread from a building to another was explored in a simple configuration as the first step. The ultimate goal of this study is to construct a model which is capable of predicting the fire spread in the cities in which a number of houses are arbitrarily located.
NTIS
Fire Prevention; Earthquakes; Fires; Flame Retardants

20010019891 NASA Marshall Space Flight Center, Huntsville, AL USA
NASA's Space Environments and Effects (SEE) Program
Minor, Jody, NASA Marshall Space Flight Center, USA; Apr. 27, 2001; 6p; In English; 7th; Spacecraft Charging Technology Conference, 23-27 Apr. 2001, Noordwijk, Netherlands; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The return of the Long Duration Exposure Facility (LDEF) in 1990 brought a wealth of space exposure data on materials, paints, solar cells, adhesives and other data on the many space environments. The effects of the harsh space environments can provide damaging or even disabling effects on a spacecraft, its sub-systems, materials and instruments. In partnership with industry, academia, and other US and international government agencies, the National Aeronautics & Space Administration's (NASA's) Space Environments & Effects (SEE) Program defines the space environments and provides technology development to accommodate or mitigate these harmful environments on the spacecraft. This program (agency-wide in scope but managed at the Marshall Space Flight Center) provides a very comprehensive and focused approach to understanding the space environment. It does this by defining the best techniques for both flight- and groundbased experimentation, updating models which predict both the environments and the environmental effects on spacecraft and ensuring that this information is properly maintained and inserted into spacecraft design programs. This paper will describe the current SEE Program and discuss several current technology development activities associated with the spacecraft charging phenomenon.
Author
Aerospace Environments; Damage; Environment Effects; Exposure

20010020017 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA
Gas Phase Chromatography of some Group 4, 5, and 6 Halides
Sylvester, E. R.; Oct. 01, 1998; 172p; In English
Report No.(s): DE00-006524; LBNL--42352; No Copyright; Avail: Department of Energy Information Bridge

Gas phase chromatography using The Heavy Element Volatility Instrument (HEVI) and the On Line Gas Apparatus (OLGA III) was used to determine volatilities of ZrBr4, HfBr4, NbBr5, TaOBr3, HaCl5, WBr6, FrBr, and BiBr3. Short-lived isotopes of Zr, Hf, Rf, Nb, Ta, Ha, W, and Bi were produced via compound nucleus reactions at the 88-Inch Cyclotron at Lawrence Berkeley National Laboratory and transported to the experimental apparatus using a He gas transport system. The isotopes were halogenated, separated from the other reaction products, and their volatilities determines by isothermal gas phase chromatography.
NTIS
Vapor Phases; Chromatography; Gas Chromatography; Heavy Elements; Volatility; Halides

20010020235 National Inst. of Standards and Technology, Fluid Science Group, Gaithersburg, MD USA
Journal of Research of the National Institute of Standards and Technology, September/October 2000. Volume 105, Number 5
2000; 160p; In English
Report No.(s): PB2001-101922; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy

This cureent journal, Volume 105, number 5, includes the following topics: Ab Initio Values of the Thermophysical Properties of Helium as Standards; Improved Near-Infrared Spectral Responsivity Scale; Comparison of the NIST and NPL Air Kerma Standards Used for X-Ray Measurements Between 10 kV and 80 kV; Material Properties of Titanium Diboride; Coding and Modulation for LMDS and Analysis of the LMDS Channel; Treasure of the Past IV: The Standard Cell Comparator, A Specialized Potentiometer; Erratum- The NIST Length Scale Interferometer; and Erratum- Possible Advantages of a Robust Evaluation of Comparisons.
NTIS
Research; Technology Assessment

20010020426 Pittsburgh Univ., Pittsburgh, PA USA
Combinatorial Approach for Novel Phosphatase Inhibitors ***Annual Report, 1 Mar. 1999-28 Feb. 2000***
Lazo, John S.; Mar. 2000; 74p; In English
Contract(s)/Grant(s): DAMD17-99-1-9465
Report No.(s): AD-A385621; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We have synthesized more than 500 new small molecules in the Combinatorial Chemistry Center (CCC) using novel parallel approaches. We have examined the biochemical activity of these compounds as well as the Diverset, which are 2,000 compounds selected by the NCI from their 130,000+ compound library and that contain maximal chemical diversity. The 500 novel small molecules synthesized by the CCC were designed around the AC/SC pharmacophore and are based on Natural Products. Within this library, we have identified FY21-alpha-alpha 09 as the most potent inhibitor of the oncogene CDC25. We also found that FY21-alpha-alpha 09 was an inhibitor of human malignant cell cycle transition in both G1 and G2/M phase consistent with its proposed ability to inhibit both CDC25A, B and C. We also found that SC-alpha-alpha 69 blocked G1 and G2/M transition and caused hyperphosphorylation of cyclin-dependent kinase 1 and 4. We have used a similar approach to identify a vitamin K analog,

compound 5, which is also an inhibitor of CDC25. We have identified 5 inhibitors of CDC25 in the NCI Diverset each having a median inhibitory concentration below 1 micro-M. They may have the potential of being new platforms for future compounds. DTIC

Chemical Analysis; Combinatorial Analysis; Molecules; Inhibitors

20010020428 California Univ., Dept. of Chemistry, Irvine, CA USA

Ultrafast Dynamics of Condensed Phase Systems ***Final Report***

Martens, Craig C.; Jan. 2000; 3p; In English

Contract(s)/Grant(s): N00014-95-1-0170

Report No.(s): AD-A385580; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In this final report, we describe the results of our ONR-funded research project in theoretical and computational chemistry. We briefly review our ONR-supported work in the following areas: (1) Development of methodology for simulating nonadiabatic dynamics in molecular systems. (2) A proposal for a new type of direct spectroscopy of ultrafast many-body bath dynamics, called nanoscale shock wave spectroscopy, and the results of molecular dynamics simulations describing its theoretical implementation. DTIC

Molecular Dynamics; Computational Chemistry; Spectroscopy

20010020488 NASA Johnson Space Center, Houston, TX USA

Visible Wavelength Spectroscopy of Ferric Minerals: A Key Tool for Identification of Ancient Martian Aqueous Environments

Murchie, Scott L., Johns Hopkins Univ., USA; Bell, J. F., III, Cornell Univ., USA; Morris, Richard V., NASA Johnson Space Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 232-233; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The mineralogic signatures of past aqueous alteration of a basaltic Martian crust may include iron oxides and oxyhydroxides, zeolites, carbonates, phyllosilicates, and silica. The identities, relative abundances, and crystallinities of the phases formed in a particular environment depend on physicochemical conditions. At one extreme, hot spring environments may be characterized by smectite-chlorite to talc-kaolinite silicate assemblages, plus crystalline ferric oxides dominated by hematite. However, most environments, including cold springs, pedogenic layers, and ponded surface water, are expected to deposit iron oxides and oxyhydroxides, carbonates, and smectite-dominated phyllosilicates. A substantial fraction of the ferric iron is expected to occur in nanophase form, with the exact mineralogy strongly influenced by Eh-pH conditions. Detection of these phases has been an objective of a large body of terrestrial telescopic, Mars orbital, and landed spectral investigations and in situ compositional measurements. However, clear identifications of many of these phases is lacking. Neither carbonate nor silica has been unequivocally detected by any method. Although phyllosilicates may occur near the limit of detection by remote sensing, in general they appear to occur in only poorly crystalline form. In contrast, compelling evidence for ferric iron minerals has been gathered by recent telescopic investigations, the Imager for Mars Pathfinder (IMP), and the Thermal Emission Spectrometer (TES) on the Mars Global Surveyor (MGS). These data yield two crucial findings: (1) In the global, high spatial resolution TES data set, highly crystalline ferric iron (as coarse-grained 'gray' hematite) has been recognized but with only very limited spatial occurrence and (2) Low-resolution telescopic reflectance spectroscopy, very limited orbital reflectance spectroscopy, and landed multispectral imaging provide strong indications that at least two broad classes of ferric iron minerals are commonplace in non-dust covered regions. Author

Mars Environment; Mars Surface; Planetary Crusts; Iron; Planetary Geology; Mars (Planet)

20010020497 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Atomic Force Microscope for Imaging and Spectroscopy

Pike, W. T., Jet Propulsion Lab., California Inst. of Tech., USA; Hecht, M. H., Jet Propulsion Lab., California Inst. of Tech., USA; Anderson, M. S., Jet Propulsion Lab., California Inst. of Tech., USA; Akiyama, T., Neuchatel Univ., Switzerland; Gautsch, S., Neuchatel Univ., Switzerland; deRooij, N. F., Neuchatel Univ., Switzerland; Staufer, U., Neuchatel Univ., Switzerland; Niedermann, Ph., Swiss Center for Electronics and Microtechnology, Inc., Switzerland; Howald, L., Nanosurf AG, Switzerland; Mueller, D., Nanosurf AG, Switzerland; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 249-250; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

We have developed, built, and tested an atomic force microscope (AFM) for extraterrestrial applications incorporating a micromachined tip array to allow for probe replacement. It is part of a microscopy station originally intended for NASA's 2001 Mars lander to identify the size, distribution, and shape of Martian dust and soil particles. As well as imaging topographically down

to nanometer resolution, this instrument can be used to reveal chemical information and perform infrared and Raman spectroscopy at unprecedented resolution.
Author
Spacecraft Instruments; Mars Missions; Dust; Atomic Force Microscopy

20010020521 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA
In Situ Noble-Gas Based Chronology on Mars
Swindle, T. D., Arizona Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2; 2p; In English; See also 20010020461
Contract(s)/Grant(s): NAG5-9198; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Determining radiometric ages in situ on another planet's surface has never been done, and there are good reasons to think that it will be extremely difficult. It is certainly hard to imagine that such ages could be measured as precisely as they could be measured on returned samples in state-of-the-art terrestrial laboratories. However, it may be possible, by using simple noble-gas-based chronology techniques, to determine ages on Mars to a precision that is scientifically useful. This abstract will: (1) describe the techniques we envision; (2) give some examples of how such information might be scientifically useful; and (3) describe the system we are developing, including the requirements in terms of mass, power, volume, and sample selection and preparation.
Author
Geochronology; Mars Missions; Mission Planning; In Situ Measurement; Mars Surface Samples

20010020628
Separation of gaseous mixtures by means of membranes
Luedtke, O.; Dec. 31, 1997; 171p; In German
Report No.(s): DE98-771133; GKSS-97/E/56; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Subject of this work is the development of a resistance model for the mass transfer through composite membranes. This model makes it possible to predict the separation characteristics of membrane modules for organic vapor-air mixtures. The feed side concentration boundary layer, the porous substructure and the dense polymer layer is considered as transport resistances. The dependance of these resistances on relevant process parameters are experimentally determined. The results show the applicability of the developed resistance model for the precalculation of separation properties of membrane modules. These calculations are based on data obtained by laboratory scale measurements with pure gases.
NTIS
Gas Mixtures; Membranes; Mass Transfer; Separation

20010020661 NASA Marshall Space Flight Center, Huntsville, AL USA
Wetting Angle and Surface Tension of Germanium Melts on Different Substrate Materials
Kaiser, N., Freiburg Univ., Germany; Croell, A., Technische Univ., Germany; Szofran, F. R., NASA Marshall Space Flight Center, USA; Benz, K. W., Freiburg Univ., Germany; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The sessile drop technique has been used to measure the wetting angle and the surface tension of molten germanium (Ge) on various substrate materials. Sapphire, fused silica, glassy carbon, graphite, SiC, carbon-based aerogel, pyrolytic boron nitride (pBN), AlN, Si3N4, and CVD diamond were used as substrate materials. In addition, the effects of different cleaning procedures and surface treatments on the wetting behavior were investigated. The highest wetting angles with values around 170 deg. were found for pBN substrates under active vacuum or with a slight overpressure of 5N Argon or forming gas (2% Hydrogen in 5N Argon). The measurement of the surface tension and its temperature dependence for Ge under a forming gas atmosphere resulted in gamma(T) = 591 - 0.077 (T-T(sub m).
Author
Germanium; Substrates; Surface Treatment; Vapor Deposition; Wetting; Interfacial Tension

20010020777
Software for nuclear spectrometry
Oct. 31, 1998; 120p; In English
Report No.(s): DE99-606813; IAEA-TECDOC-1049; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Advisory Group Meeting (AGM) on Software for Nuclear Spectrometry was dedicated to review the present status of software for nuclear spectrometry and to advise on future activities in this field. Because similar AGM and consultant's meetings had been held in the past; together with an attempt to get more streamlined, this AGM was devoted to the specific field of software

for gamma ray spectrometry. Nevertheless, many of the issues discussed and the recommendations made are of general concern for any software on nuclear spectrometry. The report is organized by sections. The 'Summary' gives conclusions and recommendations adopted at the AGM. These conclusions and recommendations resulted from the discussions held during and after presentations of the scientific and technical papers.
NTIS
Gamma Ray Spectrometers; Computer Programs

20010020860 Florida Univ., Dept. of Chemistry, Gainesville, FL USA
Adsorption and Catalytic Oxidation of Sulfide and Thioate Substrates ***Final Report, 15 Sep. 1996 - 14 Sep. 1999***
Richardson, D. E., Florida Univ., USA; Drago, R. S., Florida Univ., USA; Kassel, W. S., Florida Univ., USA; Webster, C. E., Florida Univ., USA; Cottone, A., III, Florida Univ., USA; Mateus, A. L. M. L., Florida Univ., USA; Bennett, D., Florida Univ., USA; Regino, C., Florida Univ., USA; Dec. 14, 1999; 5p; In English
Contract(s)/Grant(s): DAAH04-96-1-0423
Report No.(s): AD-A378896; ARO-35653.7-CH; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

The goal of this research was to gain a fundamental understanding of adsorptive-adsorbent interactions and apply the information obtained to the rational design of new adsorbents tailored to specific adsorptives of interest, i.e. chemical warfare agents. to this end, a multiple equilibrium analysis model (MEA) has been developed and was used to interpret adsorption isotherms and show that the derived parameters are meaningful within the context of the model. Adsorptives were selected that vary in size, polarizability, polarity, acidity, and basicity to permit adsorbent characterization in terms of these physical properties. The equilibrium constants (K's), capacities (n,'s), and enthalpies obtained from the analysis of the varied adsorptives were then used to directly compare carbons, silicas, aluminas, amorphous silica-aluminas, and zeolites as adsorbent materials. The research has led to an increased understanding of the interactions between solids adsorbents and substrates in gas adsorption and catalysis.
DTIC
Adsorption; Catalysis; Oxidation; Substrates; Sulfides

20010021031
Measurement of spectrometric magnet field of EXCHARM setup
Aleev, A. N.; Balandin, V. P.; Bordyukov, A. A.; Dec. 31, 1998; 11p; In Russian; In English
Report No.(s): DE99-602119; JINR-R-1-97-368; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The EXCHARM spectrometer is used for studying charm, strange and exotic hadrons. It is located at the neutron 5N channel of U-70 accelerator (Protvino) . The EXCHARM dipole magnet has external size 4.486 x 3.196 x 3.058 m(exp 3) with aperture 2.74 x 0.489 m(exp 2). The field measurement was made by three-component Hall magnetometer on-line computer in measurement region 2.40 x 0.32 x 3.78 m(exp 3). The apparatus and methods of the field measuring are described. The results of the measurements of the magnetic field are presented. The estimation of the measurement precision is given.
NTIS
Magnetic Fields; Magnetometers; Spectrometers

20010021032
Calculation of the TileCal magnetic forces using 3D Tosca model
Morozov, N. A.; Samsonov, E. V.; Vorozhtsov, S. B.; Nessi, M.; Dec. 31, 1998; 11p; In English
Report No.(s): DE99-602118; JINR-E-9-97-390; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The purpose of the given paper is to contribute to the new summary (taking into account the latest information) of magnetic forces, acting on various parts of the TileCal of the ATLAS detector (LHC, CERN). to get an impression of the field distribution in the vicinity of the objects under consideration of existing 3D Tosca field model of the detector was used. The detailed distribution of forces along the border of various parts of the system, derived here, is valuable for understanding the mechanics of system performance.
NTIS
Magnetic Fields; Force

20010021033
Static magnetic forces and torques in ATLAS
Morozov, N. A.; Samsonov, E. V.; Vorozhtsov, S.; Dec. 31, 1998; 11p; In English
Report No.(s): DE99-602117; JINR-E-9-97-389; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The magnetic forces acting on the various metallic objects around the ATLAS detector, are the subject of the given paper. A system designer could use the information on global forces and torque acting on various components, obtained in this report, to optimize them. The results of force calculations could also serve as additional criteria for the replacement of the magnetic baseline material of various structures by nonmagnetic ones.
NTIS
Torque; Magnetic Fields

20010021064
Destruction studies of hazardous wastes by thermal plasma
Cota, G.; Dec. 31, 1998; 118p; In Spanish; In English
Report No.(s): DE99-603701; INIS-MX-076; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Plasma technology appears promising because its high degree of controllability, capability to process waste without the adverse effects of combustion, and a very wide temperature range of operation. The goal of this work was to develop a process for a high throughput system to turn hazardous waste into inert stable products, which can be safely stored and to greatly reduce air pollution relative to incineration. The experiments have shown that the thermal plasma reactor can provide a high degree of decomposition of CCl4 , C6H6, C2Cl4 and commercial oil at low gas input speeds, with modest power requirements. Decomposition of 99.9999% has been obtained in our laboratory and all the organic components are decomposed in base molecules (C, CO, CO2, H2, HCl). The analysis of exhaust gases was made by using a mass filter quadrupole. The equipment consist of a cylindrical reactor hermetically sealed, double-walled and water-cooled container made of special steel, this container in halt the crucible which serves to receive the waste materials. The whole system is designed for a maximal internal temperature of 2000 Centigrade. The gaseous result components of the material are transferred to a scrubber unit through an exit arranged on the top of reactor. The thermal efficiency evaluation of the plasma torch was also realized, obtaining a reasonable agreement between measurements and predictions in temperature profiles.
NTIS
Hazardous Wastes; Air Pollution; Destruction; Waste Treatment; Waste Utilization

20010021242 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Nitrate Analysis in Biological Fluids by Gas Chromatography-Nitrogen-Phosphorous Detection ***Final Report***
Johnson, Avery A., Army Inst. of Surgical Research, USA; Burleson, David G., Army Inst. of Surgical Research, USA; Analytical Biochemistry; April 1996; ISSN 0003-2697; Volume 236, pp. 331-337; In English
Contract(s)/Grant(s): DA Proj. 3M1-61102-B-514
Report No.(s): AD-A383523; Article-No-0175; Copyright; Avail: Defense Technical Information Center (DTIC)

Nitrate analysis in body fluids is an important part of the study of nitric oxide metabolism. A sensitive, simple procedure for nitrate analysis was developed by producing nitrobenzene from the nitrate in the samples and benzene. The nitrobenzene produced was measured on a gas chromatograph (GC) equipped with a nitrogen-phosphorous detector. Cl(-), which interferred with the derivitization procedure, was removed as silver chloride after precipitation with silver lactate. Rat urine samples were also analyzed after elution through a C-18 reverse-phase sample preparation column to remove organic molecules that completed with benzene for the nitrate in the sample. A benzene derivative, 2-nitro-1,3-dimethylbenzene (2-nitro-m-xylene), was chosen as an internal standard for GC analysis. Recovery of nitrate was 67 plus or minus 2% in serum and 87 plus or minus 8% in urine. Sensitivity of the procedure was 1 micromolar. This procedure offers improvements in sensitivity, simplicity, and consistency over previously published procedures and makes possible the measurement of nitrate and determination of isotopic ratios by GC-MS on the same sample.
DTIC
Detection; Gas Chromatography; Nitrates; Nitrogen; Phosphorus; Mass Spectroscopy; Nitrobenzenes

20010021267 NASA Marshall Space Flight Center, Huntsville, AL USA
Electrophoretic Porosimetry of Sol-Gels
Snow, L. A., NASA Marshall Space Flight Center, USA; Smith, D. D., NASA Marshall Space Flight Center, USA; Sibille, L., NASA Marshall Space Flight Center, USA; Hunt, A. J., NASA Marshall Space Flight Center, USA; Ng, J., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 6th; Aerogels, 10 Oct. 2000, Albuquerque, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

It has been hypothesized that gravity has an effect on the formation and resulting microstructure of sol-gels. In order to more clearly resolve the effect of gravity, pores may be non-destructively analyzed in the wet gel, circumventing the shrinkage and coarsening associated with the drying procedure. We discuss the development of an electrophoretic technique, analogous to affin-

ity chromatography, for the determination of pore size distribution and its application to silica gels. Specifically a monodisperse charged dye is monitored by an optical densitometer as it moves through the wet gel under the influence of an electric field. The transmittance data (output) represents the convolution of the dye concentration profile at the beginning of the run (input) with the pore size distribution (transfer function), i.e. linear systems theory applies. Because of the practical difficulty in producing a delta function input dye profile we prefer instead to use a step function. Average pore size is then related to the velocity of this dye front, while the pore size distribution is related to the spreading of the front. Preliminary results of this electrophoretic porosimetry and its application to ground and space-grown samples will be discussed.
Author
Electrophoresis; Porosity; Sol-Gel Processes; Microstructure

20010021365 Osaka City Univ., Faculty of Engineering, Japan
Effects of H2 Gas in Sputtering Ambient on Pulse Voltage Response of ZnS:Mn Electroluminescent Device
Tsuda, Iwao, Osaka City Univ., Japan; Nitta, Atsushi, Osaka Butsuryo Coll., Japan; Tanaka, Kenji, Osaka City Univ., Japan; Maekawa, Yoshiharu, Osaka City Univ., Japan; Kusabiraki, Minoru, Osaka City Univ., Japan; Aozasa, Masao, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 13-17; In English; Copyright; Avail: Issuing Activity

Electroluminescent (EL) devices were prepared by RF magnetron sputtering method at different partial pressure of H2 gas in sputtering ambient. The effects of H2 gas in sputtering ambient on pulse voltage response were investigated for preparing high-quality EL device active layer. Luminance versus applied voltage characteristics, XRD pattern, pulse voltage response and ESR spectrum were examined. When a small amount of H2 gas was introduced in sputtering ambient, contribution of single Mn(2+) to pulse voltage response changed. It strongly suggests that small amount of H2 gas in sputtering ambient affects the concentration of single Mn(2+).
Author
Thin Films; Electroluminescence; Plasma Display Devices; Flat Panel Displays; Cathode Ray Tubes; Magnetron Sputtering

20010021402 Centre Europeen Recherche et de Formation Advance en Calcul Scientific, Toulouse, France
Numerical Simulations of Combustion in a Lean Stratified Propane-Air Mixture
Jimenez, C., Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Haworth, T., Pennsylvania State Univ., USA; Poinsot, T., Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Cuenot, B., Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Blint, R., General Motors Corp., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 133-144; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Direct numerical simulation (DNS) of combustion in globally lean non-homogeneous propane-air mixtures has been performed for several initial distributions of non-homogeneities. Results have shown a strong influence of the scale and asymmetry of this distribution on both the combustion efficiency and thermal NO production, in accordance with experimental results. The simulations also have made possible a quantitative assessment of flamelet modeling for the primary flame, which yielded remarkably good results.
Author
Direct Numerical Simulation; Combustion; Air; Gas Mixtures; Propane

20010021403 Pennsylvania State Univ., PA USA
A Probability Density Function/Flamelet Method for Partially Premixed Turbulent Combustion
Haworth, D. C., Pennsylvania State Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 145-156; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A methodology is formulated to accommodate detailed chemical kinetics, realistic turbulence/chemistry interaction, and partially premixed reactants in three-dimensional time-dependent device-scale computations. Specifically, probability density function (PDF) methods are combined with premixed laminar flamelet models to simulate combustion in stratified-charge spark-ignition reciprocating-piston IC engines. A hybrid Lagrangian/Eulerian solution strategy is implemented in an unstructured deforming-mesh engineering CFD code. Modeling issues are discussed in the context of a canonical problem: one-dimensional constant-volume premixed turbulent flame propagation. Three-dimensional time-dependent demonstration calculations are presented for a simple pancake-chamber engine.
Author
Flame Propagation; Turbulent Combustion; Probability Density Functions; Premixed Flames

20010021404 Centre Europeen Recherche et de Formation Advance en Calcul Scientific, Toulouse, France

Dynamically Thickened Flame LES Model for Premixed and Non-Premixed Turbulent Combustion

Legier, J. P., Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Poinsot, T., Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Veynante, D., Ecole Centrale de Paris, France; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 157-168; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A new Large Eddy Simulation (LES) subgrid scale turbulent combustion model, adapted to combustion regimes which are neither perfectly premixed nor non-premixed, is tested in a simplified configuration. This model does not require any a priori assumption on the flame structure and is able to compute flows where both premixed and non-premixed flamelets coexist. Three combustion regimes identified in an experiment conducted at Ecole Centrale Paris, anchored, lifted and blown-off flames, are successfully recovered in numerical simulations.

Author

Combustion Physics; Large Eddy Simulation; Turbulent Combustion; Dynamic Models; Turbulent Flames

20010021406 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia

Simulation and Modeling of the Behavior of Conditional Scalar Moments in Turbulent Spray Combustion

Cha, C. M., Stanford Univ., USA; Smith, N. S. A., Defence Science and Technology Organisation, Australia; Pitsch, H., Stanford Univ., USA; Oefelein, J. C., Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 207-218; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A series of direct numerical simulations (DNS) have been conducted to examine the mixing and reaction statistics of spray combustion in forced isotropic turbulence. Particular attention has been given to statistics conditioned on mixture fraction to determine the modifications required for mixture-fraction based gas-phase combustion models. The goal is to apply these models in the presence of evaporating fuel droplets.

Author

Combustion Physics; Isotropic Turbulence; Turbulent Combustion; Direct Numerical Simulation; Statistical Analysis; Fuel Sprays

20010021419 ALSTOM Power Ltd., Baden-Daettwil, Switzerland

A Turbulent Flame Speed Closure Model for LES of Industrial Burner Flows

Flohr, P., ALSTOM Power Ltd., Switzerland; Pitsch, H., Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 169-179; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A combustion model based on a turbulent flame speed closure (TFC) model is proposed for large-eddy simulations (LES) of lean premixed combustion in industrial gas turbine burners. This model has been originally proposed in a RANS context; the extension to LES is found to be fairly straight-forward, i.e. the turbulent quantities that determine the turbulent flame speed are obtained at the level of the grid cut-off. The model has been applied to a simple premixed jet flame in a backward-facing step combustor to investigate the combustor response to forced excitations.

Author

Combustion Physics; Large Eddy Simulation; Premixed Flames; Turbulent Flames

20010021506 Los Alamos National Lab., NM USA

Inductively Coupled Plasma: Mass Spectrometry Analysis of Plutonium Samples

Figg, D.; Martinez, A.; Drake, L.; Brink, C.; Oct. 2000; 20p; In English

Report No.(s): PB2001-102980; LA-13754-MS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

At Los Alamos National Laboratory (LANL), Inductively Coupled Plasma Mass Spectrometry (ICP-MS) is routinely used to analyze a wide variety of plutonium samples for inorganic analytes. Approximately 75% of the elements of the periodic table can easily be determined by ICP-MS analysis. Techniques that use atomic emission for element detection and quantification encounter a large number of spectral interferences when analyzing plutonium samples due to the numerous emission lines of plutonium. Mass spectrometric techniques do not have that problem. In ICP-MS the main effect plutonium has on the elemental determinations is a signal suppression. With matrix dilution and signal normalization that problem is mitigated. This report describes the ICP-MS method used in the analysis of plutonium samples and the resulting detection limits.

NTIS

Mass Spectroscopy; Plutonium; Plasmas (Physics); Chemical Analysis

20010021507 Los Alamos National Lab., NM USA

Radiochemistry Calculations of Plutonium and (241)Am Using the Rad Calc III Program

Blackadar, J. M.; Wong, A. S.; Stalnaker, N. D.; Willerton, J. R.; Sep. 2000; 24p; In English; Original contains color illustrations

Report No.(s): PB2001-102979; LA-13756-MS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The equations necessary for determining the plutonium and 241 americium content of samples from alpha and gamma-counting data are presented. Corrections for alpha absorption, background, detector efficiency, and coincident alpha counts are all considered. An empirical determination of the alpha-specific activity for different types of plutonium based on historical data is presented. Finally, a program written in the Visual Basic language to perform these calculations is also described.

NTIS

Radiochemistry; Plutonium; Americium 241; Alpha Particles; Algebra; Gamma Rays

20010021511 Los Alamos National Lab., NM USA

Development of a General Shocked-Materials-Response Description for Simulations

Valone, S. M.; Jul. 2000; 78p; In English; Original contains color illustrations

Report No.(s): PB2001-102958; LA-13665-MS; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report outlines broad modeling issues pertaining to polymeric materials behavior under detonation conditions. Models applicable system wide are necessary to cope with the broad range of polymers and complex composite forms that can appear in Laboratory weapons systems. Nine major topics are discussed to span the breadth of materials, forms, and physical phenomena encountered when shocking polymers and foams over wide ranges of temperatures, pressures, shock strengths, confinement conditions, and geometries. The recommendations for directions of more intensive investigation consider physical fidelity, computational complexity, and application over widely varying physical conditions of temperature, pressure, and shock strength.

NTIS

Shock Waves; Composite Materials; Mechanical Properties; Computerized Simulation; Mathematical Models; Polymers

26
METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20010020025 Sandia National Labs., Albuquerque, NM USA

Length Scale and Aging Effect on the Mechanical Properties of a 63Sn-37Pb Solder Alloy

Lim, T. J.; Lu, W. Y.; Nov. 05, 2000; 6p; In English

Report No.(s): DE00-758132; SAND2000-8647C; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this work, uniaxial tensile testing of a 63Sn-37Pb alloy with different specimen sizes and aging conditions had been carried out. Although the stress-strain responses of different specimen sizes and aging conditions differs, the ultimate strength of the specimens with 16 hours, 100 C aging are similar for the sizes tested. The specimens with 25 days, 100 C aging have different stress-strain response with different sizes, and have a lower ultimate strength and higher failure strain compared to 16 hours, 100 C aging specimens.

NTIS

Scale Effect; Length; Mechanical Properties; Solders; Tin Alloys; Lead Alloys

20010020088 Boeing Co., Rocketdyne Propulsion and Power, USA

Space Shuttle Main Engine Joint Data List Applying Today's Desktop Technologies to Facilitate Engine Processing

Jacobs, Kenneth, Boeing Co., USA; Drobnick, John, Boeing Co., USA; Krell, Don, Boeing Co., USA; Neuhart, Terry, Boeing Co., USA; [2001]; 1p; In English, March 2001, Orlando, FL, USA; Sponsored by International Society of Logistics, Unknown

Contract(s)/Grant(s): NAS8-45000; No Copyright; Avail: Issuing Activity; Abstract Only

Boeing-Rocketdyne's Space Shuttle Main Engine (SSME) is the world's first large reusable liquid rocket engine. The space shuttle propulsion system has three SSMEs, each weighing 7,400 lbs and providing 470,000 lbs of thrust at 100% rated power level. to ensure required safety and reliability levels are achieved with the reusable engines, each SSME is partially disassembled, inspected, reassembled, and retested at Kennedy Space Center between each flight. Maintenance processing must be performed very carefully to replace any suspect components, maintain proper engine configuration, and avoid introduction of contaminants that could affect performance and safety. The long service life, and number, complexity, and pedigree of SSME components makes logistics functions extremely critical. One SSME logistics challenge is documenting the assembly and disassembly of the complex joint configurations. This data (joint nomenclature, seal and fastener identification and orientation, assembly sequence, fastener

torques, etc.) must be available to technicians and engineers during processing. Various assembly drawings and procedures contain this information, but in this format the required (practical) joint data can be hard to find, due to the continued use of archaic engineering drawings and microfilm for field site use. Additionally, the release system must traverse 2,500 miles between design center and field site, across three time zones, which adds communication challenges and time lags for critical engine configuration data. To aid in information accessibility, a Joint Data List (JDL) was developed that allows efficient access to practical joint data. The published JDL has been a very useful logistics product, providing illustrations and information on the latest SSME configuration. The JDL identifies over 3,350 unique parts across seven fluid systems, over 300 joints, times two distinct engine configurations. The JDL system was recently converted to a web-based, navigable electronic manual that contains all the required data and illustrations in expanded view format using standard PC products (Word, Excel, PDF, Photoshop). The logistics of accurately releasing this information to field personnel was greatly enhanced via the utilization of common office products to produce a more user-friendly format than was originally developed under contract to NASA. This was done without reinventing the system, which would be cost prohibitive on a program of this maturity. The brunt of the joint part tracking is done within the logistics organization and disseminated to all field sites, without duplicating effort at each site. The JDL is easily accessible across the country via the NASA intranet directly at the SSME workstand. The advent of this logistics data product has greatly enhanced the reliability of tracking dynamic changes to the SSME and greatly reduces engineering change turnaround time and potential for errors. Since the inception of the JDL system in 1997, no discrepant parts have propagated to engine assembly operations. This presentation focuses on the challenges overcome and the techniques used to apply today's desktop technologies to an existing logistics data source.
Author
Space Shuttle Main Engine; Engineering Drawings; Logistics; Maintenance; Lists

20010020143 California Univ., San Diego, Dept. of Chemistry, La Jolla, CA USA
DURIP 99 - Instrumentation for Deposition and Etching of Ferromagnetic Nanoparticles ***Final Report, 1 Mar. 1999-29 Feb. 2000***
Kummel, Andrew C.; Dec. 19, 2000; 7p; In English
Contract(s)/Grant(s): F49620-99-1-0115Q
Report No.(s): AD-A385762; AFRL-SR-BL-TR-01-0021; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
During this award, accomplishments were made in three areas: deposition of isotropic ferromagnetic nanoparticles, etching of metallic materials, and oxidation of metals. (a) The grantees developed a technique to deposit partially anisotropic Fe nanoparticles, 200A x 76A x 8A on Ag(111) with a uniform directionality. The investigators also found that in UHV, the silver atoms spontaneously diffuse on top of the Fe nanoparticles even at 300 K. Since silver is much more difficult to etch than iron due to the lack of volatile silver halides, this spontaneous coating of Fe by Ag explains the difficulty in etching Fe particles deposited on Ag substrates. (b) The grantees also investigated the basic mechanisms of etching of Al(111) by a halogen gas, ICl. Halogen etching of metallic materials is a critical step in fabrication of magnetic sensors, spin valves, and giant magnetoresistive sensors. They found that for ICl/Al(l II) the primarily chemisorption process is remote dissociation in which the substrate harpoons in incoming ICl molecule with an electron. The dominant chemisorption process is abstraction in which ICL deposits the iodine atom onto the surface while the chlorine is ejected back into the gas phase. (c) The grantees investigated the oxidation of Al(111) by O2 and NO. Al(111) ii) was chosen since adsorbates do not diffuse on this surface at 300 K so the chemical dynamics can be investigated with room temperature STM. In both cases, it was found that chemisorption occurs via nonadiabatic charge transfer from the surface and results in abstractive chemisorption: one of the atoms from diatomic molecule sticks to the surface while the remaining atom is ejected back into the gas phase. In the case of NO, the reaction is chemically selective the oxygen sticks to the surface while the nitrogen is ejected back into the gas phase.
DTIC
Ferromagnetic Materials; Etching; Oxidation; Deposition; Metals; Isotropy

20010020285 NASA Marshall Space Flight Center, Huntsville, AL USA
Effects of Cryogenic Treatment on the Residual Stress and Mechanical Properties of an Aerospace Aluminum Alloy
Chen, Po, IIT Research Inst., USA; Malone, Tina, NASA Marshall Space Flight Center, USA; Bod, Robert, IIT Research Inst., USA; Torres, Pablo, NASA Marshall Space Flight Center, USA; [2000]; 5p; In English; AMPET Conference, 18-20 Sep. 2000, Huntsville, AL, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Investigators at Marshall Space Flight Center (MSFC) are studying the potential benefits of cryogenic treatment for aerospace Aluminum (Al) alloys. This paper reports the effects of cryogenic treatment on residual stress, tensile strength, hardness, fatigue life, and stress corrosion cracking (SCC) resistance.
Author
Aluminum Alloys; Cryogenics; Mechanical Properties; Residual Stress; Aerospace Environments

20010020290 Massachusetts Inst. of Tech., Dept. of Mechanical Engineering, Cambridge, MA USA
Large Deformation Plasticity of Polycrystalline Tantalum ***Final Report, 1 Apr. 1994-31 Mar. 1998***
Anand, Lallit, Massachusetts Inst. of Tech., USA; Dec. 21, 2000; 6p; In English
Contract(s)/Grant(s): DAAH04-94-G-0060
Report No.(s): AD-A385746; ARO-32188.7-EG; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

A physical, crystal mechanics-based theory of thermo-elasto-viscoplasticity which is valid for large strains and high strain rates at low homologous temperatures has been formulated. The theory is able to predict the macroscopic anisotropic stress-strain response, the evolution of crystallographic texture, and the macroscopic shape changes for b.c.c. tantalum. The material functions and parameters in the model were determined by calibrating the model against existing experimental results for tantalum. The model reproduces the data of these researchers rather well. The constitutive model has been implemented in the finite element program ABAQUS Explicit by writing a 'user material' subroutine. The ability of the constitutive model and computational procedures to capture the effect of initial texture on the final shape under high strain rates and large strains was evaluated by carrying out a simulation of a Taylor rod-impact experiment and by comparing the predicted final shape to that observed experimentally.
DTIC
Viscoplasticity; Tantalum; Elastoplasticity; Polycrystals; Deformation; Crystallography; Finite Element Method; Textures

20010020656 NASA Marshall Space Flight Center, Huntsville, AL USA
Thermal Modeling and Analysis of a Sub-Compact Seebeck Furnace
Wang, Francis C., Raytheon Co., USA; Peters, Palmer, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 2nd; Pan-Pacifc Basin Workshop on Microgravity Sciences, 1-4 May 2001, Pasadena, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Sub-Compact Seebeck Furnace (SCSF) is a third generation furnace designed as an experimental facility to study the phenomena of undercooling associated with directional solidification. It is intended to provide a double peak temperature profile along the axial direction with gradient zones at each end. by keeping the temperature in the central portion above the melting point of the sample, and cooling the ends of the furnace, a solid/liquid (S/L) interface can be maintained in each one of the gradient zones. A motorized motion control provides a motion to one-half of the furnace. The undercooling associated with the interface being directionally solidified can thus be studied. Modeling of the temperature profile is important to help assure that the furnace design provides the correct thermal characteristics. The furnace is designed with two halves that telescope. Results of thermal analysis based on an analytical solution using simple assumptions will be presented. The resulting temperature profile will show the salient features of the desired thermal profile and provide the general directions for thermal design. Experimental results will be used to compare with the analytical profile. Approach for numerical modeling to provide more detailed information such as two-dimensional effects will be discussed.
Author
Mathematical Models; Supercooling; Thermal Analysis; Furnaces

20010020659 NASA Marshall Space Flight Center, Huntsville, AL USA
Mixing Dynamics Induced by Traveling Magnetic Fields
Grugel, Richard N., NASA Marshall Space Flight Center, USA; Mazuruk, Konstantin, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Aerospace Science, 10 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Microstructural and compositional homogeneity in metals and alloys can only be achieved if the initial melt is homogeneous prior to the onset of solidification processing. Naturally induced convection may initially facilitate this requirement but upon the onset of solidification significant compositional variations generally arise leading to undesired segregation. Application of alternating magnetic fields to promote a uniform bulk liquid concentration during solidification processing has been suggested. to investigate such possibilities an initial study of using traveling magnetic fields (TMF) to promote melt homogenization is reported in this work. Theoretically, the effect of TMF-induced convection on mixing phenomena is studied in the laminar regime of flow.

Experimentally, with and without applied fields, both 1) mixing dynamics by optically monitoring the spreading of an initially localized dye in transparent fluids and, 2) compositional variations in metal alloys have been investigated.
Author
Alloys; Homogeneity; Homogenizing; Magnetic Fields; Solidification; Convection

20010020660 NASA Marshall Space Flight Center, Huntsville, AL USA
Novel Directional Solidification of Hypermonotectic Alloys
Grugel, R. N., NASA Marshall Space Flight Center, USA; Fedoseyev, A. I., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Aerospace Science, 10 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

There are many metal alloy systems that separate into two different liquids upon cooling from a higher temperature. Uniform microstructural development during solidification of these immiscible liquids on Earth is hampered by inherent density differences between the phases. Microgravity processing minimizes settling but segregation still occurs due to gravity independent wetting and coalescence phenomena. Experiments with the transparent organic, metal analogue, succinonitrile-glycerol system were conducted in conjunction with applied ultrasonic energy. The processing parameters associated with this technique have been evaluated in view of optimizing dispersion uniformity. Characterization of the experimental results in terms of an initial modeling effort will also be presented.
Author
Directional Solidification (Crystals); Monotectic Alloys; Ultrasonic Processing; Dispersion

20010020785
Aspects of welding of zircaloy thin tube to end plugin the experimental welding facility of fuel element fabrication laboratory
Shafy, M.; El-Hakim, E.; Dec. 31, 1997; 38p; In English
Report No.(s): DE99-606795; AREAEA-341; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The work was achieved within the scope of developing egyptian nuclear fuel fabrication laboratory in inshas. It showed the results of developing a welding facility for performing a qualified zircaloy-2 and 4 thin tubes to end weld joints. The welding chamber design was developed to get qualified weld for both PWR and CANDU fuel rod configurations. Experimental works for optimizing the welding parameters of tungsten inert gas (TIG) welding and electron beam (EB) welding processes were achieved. The ld penetration deeper than the wall tube thickness can be obtained for qualified end plug weld joints. It recommended to use steel compensating block for radiographic inspection of end plug weld joints. The predominate defects that can be expected in end plug weld joints, are lack of penetration and cavity. The microstructure of the fusion zone and heat affected zones are Widmanstaetten structure and its grain size is drastically sensible to the heat generation and removal of arc welding.
NTIS
Electron Beam Welding; Gas Tungsten Arc Welding; Heat Affected Zone; Zircaloys (Trademark); Welded Joints

20010020803 National Inst. of Standards and Technology, Gaithersburg, MD USA
Model Phase Diagrams for an FCC Alloy
Braun, R. J., Delaware Univ., USA; Zhang, J., Delaware Univ., USA; Cahn, J. W., National Inst. of Standards and Technology, USA; McFadden, G. B., National Inst. of Standards and Technology, USA; Wheeler, A. A., Southampton Univ., UK; Jan. 19, 2000; 22p; In English
Report No.(s): PB2000-101947; NISTIR-6463; Copyright Waived; Avail: CASI; A01, Microfiche; A03, Hardcopy

We describe a mean field free energy model that allows the computation of realistic phase diagrams for a particular set of ordering transitions in face centered cubic (FCC) binary alloys. The model is based on a sixth-order Landau expansion of free energy function in terms of the three nonconserved order parameters that describe ordering on the underlying FCC lattice. When combined with appropriate gradient energy terms, this model will allow the self-consistent calculation of energetic and kinetic anistropies of phase boundaries in future work.
Author
Binary Alloys; Free Energy; Gradients; Mathematical Models

20010020862 University of Southern California, Los Angeles, CA USA

A critical Evaluation of the Factors Influencing High Strain Rate Superplasticity ***Final Report, Aug. 1996 - Jan. 2000***

Langdon, Terence G., University of Southern California, USA; Jan. 31, 2000; 9p; In English

Contract(s)/Grant(s): DAAH04-96-1-0332

Report No.(s): AD-A378955; ARO-34391.49-MS; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

This Final Report lists the publications arising from this research program and also provides a brief description of the major findings. There were two major objectives of this program and both were fulfilled within the research period. These objectives were (1) to obtain a detailed understanding of the creep properties of metal matrix composites which are important in the field of high strain rate superplasticity and (2) to attempt to extend the range of materials exhibiting high strain rate superplasticity to commercial unreinforced alloys by using a new processing technique in which an ultrafine grain size is achieved by introducing severe plastic deformation. This latter objective has led to the first demonstration of superplasticity at very high strain rates and at relatively low temperatures in conventional materials.

DTIC

Strain Rate; Superplasticity; Creep Properties; Metal Matrix Composites

20010021213 NASA Marshall Space Flight Center, Huntsville, AL USA

Cryogenic Treatment of Al-Li Alloys for Improved Weldability, Repairability, and Reduction of Residual Stresses

Malone, Tina W., NASA Marshall Space Flight Center, USA; Graham, Benny F., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English, 26-30 Mar. 2001, Cocoa Beach, FL, USA; Sponsored by NASA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Service performance has shown that cryogenic treatment of some metals provides improved strength, fatigue life, and wear resistance to the processed material. Effects such as these were initially discovered by NASA engineers while evaluating spacecraft that had returned from the cold vacuum of space. Factors such as high cost, poor repairability, and poor machinability are currently prohibitive for wide range use of some aerospace aluminum alloys. Application of a cryogenic treatment process to these alloys is expected provide improvements in weldability and weld properties coupled with a reduction in repairs resulting in a significant reduction in the cost to manufacture and life cycle cost of aerospace hardware. The primary purpose of this effort was to evaluate the effects of deep cryogenic treatment of some aluminum alloy plate products, welds, and weld repairs, and optimize a process for the treatment of these materials. The optimized process is being evaluated for improvements in properties of plate and welds, improvements in weldability and repairability of treated materials, and as an alternative technique for the reduction of residual stresses in repaired welds. This paper will present the results of testing and evaluation conducted in this effort. These results will include assessments of changes in strength, toughness, stress corrosion susceptability, weldability, repairability, and reduction in residual stresses of repaired welds.

Author

Cryogenics; Maintainability; Weldability; Aluminum-Lithium Alloys; Optimization; Residual Stress

20010021219 Universities Space Research Association, Huntsville, AL USA

Cellular Spacing Selection During the Directional Solidification of Binary Alloys. A Numerical Approach

Catalina, Adrian V., Universities Space Research Association, USA; Sen, S., Universities Space Research Association, USA; [2001]; 1p; In English; Science of Casting and Solidification, 28 May 2001, Brasov, Romania; No Copyright; Avail: Issuing Activity; Abstract Only

The evolution of cellular solid/liquid interfaces from an initially unstable planar front was studied by means of a two-dimensional computer simulation. The developed numerical model makes use of an interface tracking procedure and has the capability to describe the dynamics of the interface morphology based on local changes of the thermodynamic conditions. The fundamental physics of this formulation was validated against experimental microgravity results and the predictions of the analytical linear stability theory. The performed simulations revealed that in certain conditions, based on a competitive growth mechanism, an interface could become unstable to random perturbations of infinitesimal amplitude even at wavelengths smaller than the neutral wavelength, lambda(sub c), predicted by the linear stability theory. Furthermore, two main stages of spacing selection have been identified. In the first stage, at low perturbations amplitude, the selection mechanism is driven by the maximum growth rate of instabilities while in the second stage the selection is influenced by nonlinear phenomena caused by the interactions between the neighboring cells. Comparison of these predictions with other existing theories of pattern formation and experimental results will be discussed.

Author

Directional Solidification (Crystals); Thermodynamics; Morphology; Mathematical Models; Binary Alloys

20010021505 Los Alamos National Lab., NM USA

Beryllium:Ceramic Compatibility Tests

Hanrahan, R. J.; Oct. 2000; 18p; In English

Report No.(s): PB2001-102981; LA-13759-MS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We are interested in the possibility of using induction melting in order to recycle beryllium components. This process will require the use of a container for the molten Be. Although BeO is the obvious choice of materials based on compatibility, engineering considerations dictated that other materials be considered. Therefore, a series of experiments was performed in order to test the compatibility of molten beryllium with various ceramic crucible materials. The materials tested include Al2O3, Y2O3, MgO, ZrO2, SiC and SiO2 (fused silica). Alumina exhibited the best compatibility among the materials tested, based on the relatively trivial observation that the molten beryllium did not stick to alumina. We have evaluated the reaction products and to some extent the mechanism of reaction of beryllium with each of these materials. In the case of alumina for example, the compatibility may be attributed to the formation of a layer of an intermediate BeO-Al2O3 phase or phases. In the magnesia, yttria, and zirconia Be systems ternary oxides are not observed but the oxides may be reduced by beryllium resulting in formation of intermetallic phases and beryllium oxide. The silicon based compounds are reduced to form BeO and free silicon. The significance of these results with regard to the published thermodynamic data (particularly phase diagrams) will be discussed. Additional tests were conducted to evaluate the products of the reaction between molten beryllium and stainless steel. This report also discusses the results of these tests.

NTIS

Beryllium; Ceramics; Crucibles; Melting; Induction; Chemical Compatibility

20010021523 Sandia National Labs., Albuquerque, NM USA

Microbially Induced Iron Oxidation: What, Where, How

Schiermeyer, E. M.; Provencio, P. P.; Northup, D. E.; Aug. 15, 2000; 9p; In English

Report No.(s): DE00-761873; SAND2000-2068C; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

From the results of the different bacterial cells seen, it is fairly certain that Gallionella is present because of the bean-shaped cells and twisted stalks found with the TEM. The authors cannot confirm, though, what other iron-oxidizing genera exist in the tubes, since the media was only preferential and not one that isolated a specific genus of bacteria. Based on the environment in which they live and the source of the water, they believe their cultures contain Gallionella, Leptothrix, and possibly Crenothrix and Sphaerotilus. They believe the genus Leptothrix rather than Sphaerotilus exist in the tubes because the water source was fresh, unlike the polluted water in which Sphaerotilus are usually found. The TEM preparations worked well. The cryogenic method rapidly froze the cells in place and allowed them to view their morphology. The FAA method, as stated previously, was the best of the three methods because it gave the best contrast. The gluteraldehyde samples did not come out as well. It is possible that the gluteraldehyde the authors prepared was still too concentrated and did not mix well. Although these bacteria were collected from springs and then cultured in an environment containing a presumably pure iron-bearing metal, it seems the tube already containing Manganese Gradient Medium could be used with a piece of metal containing these bacteria. A small piece of corroding metal could then be inserted into the test tube and cultured to study the bacteria.

NTIS

Oxidation; Iron; Bacteria

20010021531 Sandia National Labs., Albuquerque, NM USA

Weld Properties of a Free Machining Stainless Steel

Brooks, J. A.; Goods, S. H.; Robino, C. V.; Aug. 01, 2000; 25p; In English

Report No.(s): DE00-760519; SAND2000-8002; No Copyright; Avail: Department of Energy Information Bridge

The all weld metal tensile properties from gas tungsten arc and electron beam welds in free machining austenitic stainless steels have been determined. Ten heats with sulfur contents from 0.04 to 0.4 wt.% and a wide range in Creq/Nieq ratios were studied. Tensile properties of welds with both processes were related to alloy composition and solidification microstructure. The yield and ultimate tensile strengths increased with increasing Creq/Nieq ratios and ferrite content, whereas the ductility measured by RA at fracture decreased with sulfur content. Nevertheless, a range in alloy compositions was identified that provided a good combination of both strength and ductility. The solidification cracking response for the same large range of compositions are discussed, and compositions identified that would be expected to provide good performance in welded applications.

NTIS

Tensile Properties; Machining; Arc Welding; Electron Beams; Weldability; Austenitic Stainless Steels

20010021628 Pacific Northwest National Lab., Richland, WA USA

Active Waste Materials Corrosion and Decontamination Tests

Danielson, M. J.; Elmore, M. R.; Pitman, S. G.; Aug. 15, 2000; 35p; In English

Report No.(s): DE00-760086; PNWD-3051; No Copyright; Avail: Department of Energy Information Bridge

Stainless steel alloys, 304L and 316L, were corrosion tested in representative radioactive samples of three actual Hanford tank waste solutions (Tanks AW-101, C-104, AN-107). Both the 304L and 316L exhibited good corrosion performance when immersed in boiling waste solutions. The maximum general corrosion rate was 0.015 mm/y (0.60 mils per year). Generally, the 304L had a slightly higher rate than the 316L. No localized attack was observed after 122 days of testing in the liquid phase, liquid/vapor phase, or vapor phase. Radioactive plate-out decontamination tests indicated that a 24-hour exposure to 1 (und M) HNO3 could remove about 99% of the radioactive components in the metal film when exposed to the C-104 and AN-107 solutions. The decontamination results are less certain for the AW-101 solution, since the initial contamination readings exceeded the capacity of the meter used for this test.

NTIS

Liquid Wastes; Corrosion Tests; Decontamination; Stainless Steels; Corrosion Resistance; Radioactive Wastes; Materials Tests

20010021744 Auburn Univ., Dept. of Mechanical Engineering, AL USA

Refractory Alloy Single Crystals for High Temperature Applications ***Final Report, 1 Apr. 1997 - 30 Sep. 2000***

Zee, Ralph H.; Gale, William F.; Dec. 01, 2000; 61p; In English

Contract(s)/Grant(s): F49620-97-1-0167

Report No.(s): AD-A385455; AFRL-SR-BL-TR-00-0694; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Refractory metals and intermetallic alloys are important in high temperature aerospace systems where deformation must be maintained at a low level. This DEPSCoR project was devoted to the processing such single crystals, joining of these crystals and fracture analysis of the interface. Advances have been made in these three areas, especially in the processing of single crystals with enhanced mechanical properties. An electron beam float zone melting method was used successfully to fabricate single crystals based on three alloy systems: Ni3Al, molybdenum alloys and tungsten alloys. Due to the complex Ni3Al phase diagram, slight variations in the compositions resulted in significant difference in the growth characteristics. In the case of molybdenum alloys, the ease of single crystal formation depends on the selection of the solutes and their concentration. Little difficulty was encountered when growing the Mo-Nb alloys. The ease of crystal growth in the Mo-Nb binary system was attributed to the small two-phase region and the complete solubility of Mo-Nb, The growth characteristics are in accord with the interface stability criterion of a planar interface.

DTIC

Single Crystals; Refractory Metals; Refractory Metal Alloys; Metal Crystals; Aerospace Systems

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

20010019924 Massachusetts Univ., Dept. of Polymer Science and Engineering, Amherst, MA USA

Synthesis and Characterization of Chlorinated Bisphenol-Based Polymers and Polycarbodiimides as Inherently Fire-Safe Polymers

Stewart, Jennifer R.; Aug. 2000; 187p; In English

Contract(s)/Grant(s): 99G 035

Report No.(s): AD-A384479; DOT/FAA/AR-00/39; Copyright; Avail: Defense Technical Information Center (DTIC)

Two different types of polymers were synthesized and their degradation and combustion behavior were investigated. The first class, 1,1-dichloro-2,2-(4-hydroxyphenyl)ethylidene (bisphenol C) based polymers, were found to be among the most fire-resistant polymers with peak heat release capacities as low as 20 J/g-K. Polymers containing bisphenol C all exhibited exothermic decomposition behavior. When compared to corresponding bisphenol-A-based polymers, these bisphenol-C- containing polymers had higher char yields and lower decomposition temperatures. The presence of bisphenol C in materials, whether as a co-monomer or blends, showed a char enhancement effect; yielding higher char than what is expected by a purely additive effect. Bisphenol C polyarylates and polycarbonates yielded large amounts of HCl and carbon dioxide upon decomposition. Compared with other bisphenol-based polymers, polycarbonates and polyarylates containing bisphenol C yielded significantly less amounts

of monomer. Decreasing the concentration of bisphenol C in the copolymers or blends yielded relatively more monomer in the degradation products.
DTIC
Polycarbonates; Synthesis (Chemistry); Chlorination; Combustion; Degradation

20010020038 Monash Univ., Dept. of Materials Engineering, Clayton, Australia
The Seventh International Symposium on Polymer Electrolytes (ISPE7)
Dec. 06, 2000; 144p; In English; 7th; Polymer Electrolytes, 6-11 Aug. 2000, Noosa, Australia
Contract(s)/Grant(s): F62562-99-M-9098
Report No.(s): AD-A384927; AOARD-CSP-98-29; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Conference proceedings include: Poster Session I; GEL Electrolytes I and II; New Systems; Applications I and II; Port & Poster Session II; Theory/Spectroscopy I and II; Composite and Proton Conductors; and Workshop on Impedance Analysis: Part I and Part II.
DTIC
Conferences; Solid Electrolytes; Polymers; Gels; Electrochemistry; Fuel Cells

20010020173 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Qualification of an Environmentally Safe and Effective Paint Removal Process for Aircraft
Kozol, Joseph; Aug. 1999; 10p; In English
Report No.(s): AD-A385353; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
In response to fleet and depot needs to reduce hazardous waste in aircraft paint stripping and to conform to regulations eliminating the use of toxic chemical paint strippers, the Naval Air Systems Team (Materials Division, Depots and Headquarters) teamed with the Air Force at Warner Robins Air Logistics Center in proof of concept development, characterization and demonstration of a mature, advanced paint removal system, the Boeing xenon/flashlamp CO2 (Flashjet (Trade name)) process. Extensive metallic and composite materials testing was conducted. This paper describes the development and characterization program leading to authorization of the process for use on fixed-wing Navy aircraft.
DTIC
Hazardous Wastes; Paint Removal; Environmental Tests

20010020210 NASA Marshall Space Flight Center, Huntsville, AL USA
Development of Core Cladding Fabrication Techniques for Phase I Fission Propulsion Systems
Salvail, Patrick G., NASA Marshall Space Flight Center, USA; Reid, Robert S., Los Alamos National Lab., USA; Ring, Peter J., Advanced Methods and Materials, USA; Nov. 14, 2001; 6p; In English; STAIF-2001 Conference, 11-14 Feb. 2001, Albuquerque, NM, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS8-97105; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Phase I fission propulsion systems focus on safety, timely development, and affordability. Prototype and flight units can be tested at full thrust, using resistance heaters to closely simulate heat from a fission reaction. In Phase I ground testing, one goal is to establish a reliable and affordable manufacturing technique for fabricating a flight-like core. A refractory metal (Mo) has been suggested for the core substrate, primarily due to the existence of a significant database for Mo/LJ02 fuel. The core can be fabricated by bundling Mo tubes with a bonding system that meets preliminary test goals. These criteria include materials compatibility, ability to maintain thermal and structural integrity during 10,000 hours of operation, and fabrication with existing facilities. This paper describes an effort to investigate several fabrication techniques in a cost-effective manner. First, inexpensive materials were tested at low temperatures to determine the relative effectiveness of such techniques as welding, brazing, plating, and vacuum plasma spraying (VPSing). Promising techniques were chosen for further evaluation, including thermal and structural studies, using ceramic tubing at intermediate temperatures. The most desirable technique will be tested on actual Mo tubing at anticipated operating temperatures. This work is being performed by the National Aeronautics & Space Administration (NASA) at George C. Marshall Space Flight Center (MSFC), Los Alamos National Laboratory (LANL), and Advanced Methods & Materials (AMM), Inc.
Author
Cladding; Fabrication; Manufacturing; Fission; Propulsion System Configurations; Product Development

20010020258 NASA Marshall Space Flight Center, Huntsville, AL USA

Structural Modeling of a Five-Meter Thin Film Inflatable Antenna/Concentrator With Rigidized Support Struts

Smalley, Kurt B., Clarkson Univ., USA; Tinker, Michael L., NASA Marshall Space Flight Center, USA; Apr. 19, 2001; 7p; In English; AIAA Structures, Structural Dynamics, and Materials Conference, 16-19 Apr. 2001, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 632-70-01

Report No.(s): AIAA Paper 2001-1412; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Dynamic characterization of a non-rigidized thin film inflatable antenna/solar concentrator structure with rigidized composite support struts is described in detail. A two-step finite element modeling approach in MSC/NASTRAN is utilized, consisting of: (1) a nonlinear static pressurization procedure used to obtain the updated stiffness matrix, and (2) a modal ”restart” eigen solution that uses the modified stiffness matrix. Unique problems encountered in modeling of this large 5-m lightweight inflatable are identified, including considerable difficulty in obtaining convergence in the nonlinear pressurization solution. It was found that the extremely thin polyimide film material (.001 in or I mil) presents tremendous problems in obtaining a converged solution when internal pressure loading is applied. It was concluded that the ratios of film thickness to other geometric dimensions such as torus cross-sectional and ring diameter and lenticular diameter are the critical parameters for convergence of the pressurization procedure. Comparison of finite element predictions for frequency and mode shapes with experimental results indicated reasonable agreement considering the complexity of the structure, the film-to-air interaction, and the nonlinear material properties of the film. It was also concluded that analysis should be done using different finite element to codes to determine if a more robust and stable solution can be obtained.

Author

Dynamic Characteristics; Structural Analysis; Thin Films; Antennas; Concentrators; Mathematical Models; Film Thickness; Inflatable Structures

20010020271 EC/R, Inc., Durham, NC USA

Implementation Document for the Polyether Polyols Production NESPAP (40 CFR 63, Subpart PPP) ***Final Report***

McDonald, J., EC/R, Inc., USA; Sep. 2000; 256p; In English

Report No.(s): PB2001-102227; No Copyright; Avail: National Technical Information Service (NTIS)

National emission standards to control emissions of hazardous air pollutants from major sources producing polyether polyols were published in the Federal Register 6/1/99, 64FR 29420. This document contains information to help State and local agencies for air pollution control, as well as the regulated community, to carry out these standards. This document summarizes the NESHAP requirements and also provides inspection, checklists and example notification and reporting forms.

NTIS

Air Pollution; Exhaust Emission; Exhaust Gases; Pollution Control; Hazardous Materials

20010020339 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Corrosion Protection of Aluminum and its Alloys Using Electroactive Polymers ***Final Report, 1 Mar. 1996 - 31 Aug. 1999***

Epstein, Arthur J.; Aug. 31, 2000; 19p; In English

Contract(s)/Grant(s): F49620-96-1-0080

Report No.(s): AD-A385722; AFRL-SR-BL-TR-00-0795; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The AFOSR funded program was designed to specifically test the ability of electroactive polymers, especially polyanilines, to provides corrosion protection for aluminums, especially the copper (approximately 4 to 5%) containing AA2024-T3 alloy of key interest to the Air Force. This program demonstrated the anti-corrosion capability of polyaniline coatings on aluminum alloy 2024-T3. In particular, undoped emeraldine base, fully sulfonated polyaniline (NSPAN), and undoped trimer coatings on AA2024-T3 were shown to reduce pitting in argon deaerated 0.1M NaCl using potentiodynamic polarization studies. The corrosion potential was shifted to more noble, and corrosion current was reduced 100- to 1000-fold in pH is greater than /- 3 environments. The anti-corrosion capability of emeraldine base polyaniline coatings of AA2024-T3 in 0.1M NaCl further was been demonstrated by X-ray photoelectron spectroscopy (XPS) depth profiling which showed a clear depletion of Cu for is greater than /- 500 A. Visual inspections demonstrated the effectiveness of sulfonated polyaniline solutions at preventing corrosion of aluminum and iron alloys. A new mechanism of corrosion reduction in aluminum alloys (different from that operative in ferrous alloys) was proposed, i.e., copper depletion by an active polymer such as polyaniline at the corroding surface.

DTIC

Corrosion Prevention; Aluminum Alloys; Aluminum; Electroactive Polymers

20010020380 Lockheed Martin Michoud Space Systems, New Orleans, LA USA

Adhesive Bonding Characterization of Composite Joints for Cryogenic Usage

Graf, Neil A., Lockheed Martin Michoud Space Systems, USA; Schieleit, Gregory F., Lockheed Martin Michoud Space Systems, USA; Biggs, Robert, Lockheed Martin Michoud Space Systems, USA; [2000]; 7p; In English, 5-9 Nov. 2000, Boston, MA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA

Contract(s)/Grant(s): NCC8-115; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The development of polymer composite cryogenic tanks is a critical step in creating the next generation of launch vehicles. Future reusable launch vehicles need to minimize the gross liftoff weight (GLOW). This weight reduction is possible due to the large reduction in weight that composite materials can provide over current aluminum technology. In addition to composite technology, adhesively bonded joints potentially have several benefits over mechanically fastened joints, such as weight savings and cryogenic fluid containment. Adhesively bonded joints may be used in several areas of these cryogenic tanks, such as in lobe-to-lobe joints (in a multi-lobe concept), skirt-to-tank joint, strut-to-tank joint, and for attaching stringers and ring frames. The bonds, and the tanks themselves, must be able to withstand liquid cryogenic fuel temperatures that they contain. However, the use of adhesively bonded composite joints at liquid oxygen and hydrogen temperatures is largely unknown and must be characterized. Lockheed Martin Space Systems Company, Michoud Operations performed coupon-level tests to determine effects of material selection, cure process parameters, substrate surface preparation, and other factors on the strength of these composite joints at cryogenic temperatures. This led to the selection of a material and process that would be suitable for a cryogenic tank. KEY WORDS: Composites, Adhesive Bonding, Cryogenics

Author

Fabrication; Bonded Joints; Cryogenic Fluid Storage; Storage Tanks; Weight Reduction; Adhesive Bonding; Composite Materials

20010020405 Massachusetts Univ., Dept. of Polymer Science and Engineering, Amherst, MA USA

Synthesis and Characterization of Chlorinated Bisphenol-Based Polymers and Polycarbodiimides as Inherently Fire-Safe Polymers ***Final Report***

Stewart, J. R., Massachusetts Univ., USA; Aug. 2000; 194p; In English

Contract(s)/Grant(s): 99G035

Report No.(s): PB2001-101966; Copyright; Avail: National Technical Information Service (NTIS)

Two different types of polymers were synthesized and their degradation and combustion behavior were investigated. The first class, 1,1-dichloro-2, 2-(4-hydroxyphenyl) ethylidene(Bisphenol C) based polymers, were found to be among the most fire-resistant polymers with peak heat release capacities as low as 20 J/g-K. Polymers containing bisphenol C all exhibited exothermic decomposition behavior. When compared to corresponding bisphenol-A-based polymers, these bisphenol-C-containing polymers had higher char yields and lower decomposition temperatures. The second class of polymers studied were polycarbodiimides, which generally decompose in an endothermic manner toyield quantitative amounts of monomer.

NTIS

Polymers; Synthesis (Chemistry); Bisphenols; Combustion; Thermal Degradation; Flame Retardants

20010020417 Colorado Univ., Boulder, CO USA

Ion and Neutral Dynamics of Ceramic Materials Formation and Atmospheric Chemistry ***Final Report, 15 Nov. 1997 - 14 Nov. 2000***

Leone, Stephen R.; Bierbaum, Veronica M.; Nov. 27, 2000; 20p; In English

Contract(s)/Grant(s): F49620-98-1-0100

Report No.(s): AD-A385723; AFRL-SR-BL-TR-00-0796; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An ultrafast x-ray laser system and experimental apparatus have been fully constructed, calibrated and characterized. A titanium sapphire ultrafast laser is tightly focused into a rare gas jet, where high harmonics of the laser are created. A single harmonic can be isolated with a grazing-incidence grating and focused on to a gaseous sample to induce photoionization. Ejected electrons are energy analyzed using a magnetic bottle time-of-flight spectrometer. Harmonics up to the 65th have been generated and photoelectron spectra of helium, krypton, xenon, nitrogen and nitric oxide have been examined. The energy bandwidth has been experimentally determined, and the first time-resolved photoelectron spectra of dissociating states of bromine have been achieved.

DTIC

Ceramics; Atmospheric Chemistry; Molecular Dynamics

20010020435 NASA Glenn Research Center, Cleveland, OH USA

Micromechanical and Electrical Properties of Monolithic Aluminum Nitride at High Temperatures

Goldsby, Jon C., NASA Glenn Research Center, USA; January 2001; 14p; In English

Contract(s)/Grant(s): RTOP 523-31-13

Report No.(s): NASA/TM-2000-210471-REV1; NAS 1.15:210471-REV1; E-12439-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Micromechanical spectroscopy of aluminum nitride reveals it to possess extremely low background internal friction at less than 1 x 10 (exp -4) logarithmic decrement (log dec.) from 20 to 1200 C. Two mechanical loss peaks were observed, the first at 350 C approximating a single Debye peak with a peak height of 60 x 10 (exp -4) log dec. The second peak was seen at 950 C with a peak height of 20 x 10 (exp -4) log dec. and extended from 200 to over 1200 C. These micromechanical observations manifested themselves in the electrical behavior of these materials. Electrical conduction processes were predominately intrinsic. Both mechanical and electrical relaxations appear to be thermally activated processes, with activation energies of 0.78 and 1.32 eV respectively.

Author

Aluminum Nitrides; Electrical Properties; High Temperature; Micromechanics; Elastic Properties

20010020752 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia

Emulsified Butadine Polymerization *Polimerisasi Butadien Secara Emulsi*

Wibowo, Heri Budi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Rochmadi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Sulistyo, Hary, Gadjah Mada Univ., Indonesia; Warta LAPAN; July 2000; ISSN 0126-0408; Volume 2, No. 3, pp. 138-150; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The objective of this research was to study emulsion polymerization of butadiene using hydrogen peroxide-Fe(II) as an initiator. This initiator was used to produce HTPB (hydroxy terminated polybutadiene). The HTPB can be used as an elastomer and a solid propellant binder. The polymerization was carried out in an autoclave, equipped with a manometer, a pyrometer, a sampling valve, and stirrer. The reaction was conducted at 5.5 atm, 28 C, and in the absence of oxygen. The autoclave was filled with a certain amount of initiator (0.103 to 103 g), aerosol OT (0.1 to 0.5 g), water (300 g), and liquid butadiene (6.81 g). Butadiene was condensed by an ethanol refrigerator. The amount of polymer product was determined by Medalia total solid method. Within the range of the experimental conditions, the increasing of temperatures, concentrations of initiator and emulsifier caused the increase of the reaction rate. Based on a ten degree coefficient, the polymerization was certainly controlled by reaction rate, and that reaction rate was first order with respect to the monomer concentration. The reaction rate depended on polymer particle number (N). The polymer particle number depends on the emulsifier ([I](sub o)) and the initiator (C(sub So)) concentrations, that could be expressed as: N approx. = [I](sub o)(sup 0.48)C(sub So)(sup 0.68). The relation of polymerization rate constant (K') with the temperature (T) followed Arrhenius type equation. For the composition of butadiene (6.81 g), water (300 g), Aerosol OT (0.5 g), hydrogen peroxide (1.03 g), K4Fe(CN)6 3H2O (0.02g), and fructose (0.5 g), the relation of polymerization rate constant (K') with the temperature, emulsifier and the initiator concentration could be written K' = 5.2x10(exp 9) N exp(-9677/RT)/hr.

Author

HTPB Propellants; Polymerization; Reaction Kinetics; Butadiene

20010020784

Investigation of some characteristics for nickel ferrite prepared by aerosolization

El-Masry, M. A. A.; Khater, E. M. H.; Gaber, A.; Dec. 31, 1997; 28p; In English

Report No.(s): DE99-606796; AREAEA-342; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this report some characteristics of nickel ferrite powder prepared through the aerosolization technique by atomization were investigated. It was found that both concentration of the solution and temperature affect the powder characteristics. The increase of the pyrolysis temperature increases both the degree of crystallinity and particle size but decreases the specific surface area. Lowering the concentration of the solution. raises the decomposition efficiency and produces lower yield with smaller particle size.

NTIS

Aerosols; Crystallization; Decomposition; Nickel; Ferrites; Metal Powder

20010020947 NASA Marshall Space Flight Center, Huntsville, AL USA

Dynamic Fatigue of ULE Glass

Tucker, Dennis S., NASA Marshall Space Flight Center, USA; Nettles, Alan T., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 19th; International Congress on Glass, 2-6 Jul. 2001, Edinburgh, UK; No Copyright; Avail: Issuing Activity; Abstract Only

Ultra Low Expansion (ULE) glass is used in a number of applications which require a low thermal expansion coefficient. One such application is telescope mirror elements. An allowable stress can be calculated for this material based upon modulus of rupture data; however, this does not take into account the problem of delayed failure. Delayed failure, due to stress corrosion can significantly shorten the lifetime of a glass article. Knowledge of the factors governing the rate of subcritical flaw growth in a given environment enables the development of relations between lifetime, applied stress and failure probability for the material under study. Dynamic fatigue is one method of obtaining the necessary information to develop these relationships. In this study, the dynamic fatigue method was used to construct time-to-failure diagrams for both 230/270 ground and optically polished samples. The grinding and polishing process reduces the surface flaw size and subsurface damage, and relieves residual stress by removing materials with successively smaller grinding media. This resulted in an increase in the strength of the optic during the grinding and polishing sequence. There was also an increase in the lifetime due to grinding and polishing. It was found that using the fatigue parameters determined from the 230/270 grit surface are not significantly different from the optically polished values. Although the lower bound of the polished samples is more conservative, neither time-to-failure curves lie beyond the upper or lower bound of the confidence limits. Therefore, designers preferring conservative limits could use samples without residual stress present (polished samples) to determine the fatigue parameters and inert Weibull parameters from samples with the service condition surface, to determine time-to-failure of the optical element.
Author
Failure; Glass; Optical Properties; Fatigue (Materials)

20010020949 NASA Marshall Space Flight Center, Huntsville, AL USA
Utilization of Infrared Fiber Optic in the Automotive Industry
Tucker, Dennis S., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 7th; International Glass Processing Days, 18-21 Jun. 2001, Tampere, Finland; No Copyright; Avail: Issuing Activity; Abstract Only

Fiber optics are finding a place in the automotive industry. Illumination is the primary application today. Soon, however, fiber optics will be used for data communications and sensing applications. Silica fiber optics and plastic fibers are sufficient for illumination and communication applications however, sensing applications involving high temperature measurement and remote gas analysis would benefit from the use of infrared fiber optics. Chalcogonide and heavy metal fluoride glass optical fibers are two good candidates for these applications. Heavy metal fluoride optical fibers are being investigated by NASA for applications requiring transmission in the infrared portion of the electromagnetic spectrum. Zirconium-Barium-Lanthanum-Aluminum-Sodium-Fluoride (ZBLAN) is one such material which has been investigated. This material has a theoretical attenuation coefficient 100 times lower than that of silica and transmits into the mid-IR. However, the measured attenuation coefficient is higher than silica due to impurities and crystallization. Impurities can be taken care of by utilizing cleaner experimental protocol. It has been found that crystallization can be suppressed by processing in reduced gravity. Fibers processed in reduced gravity on the KC135 reduced gravity aircraft were found to be free of crystals while those processed on the ground were found to have crystals. These results will be presented along with plans for producing continuous lengths of ZBLAN optical fiber on board the International Space Station.
Author
Automobiles; Fiber Optics; Technology Utilization; Manufacturing; Impurities

20010020950 Wisconsin Univ., Coll. of Engineering Mathematics and Science, Platteville, WI USA
Slow Crack Growth and Fatigue Life Prediction of Ceramic Components Subjected to Variable Load History ***Final Report***
Jadaan, Osama, Wisconsin Univ., USA; [2001]; 18p; In English
Contract(s)/Grant(s): NAG3-2242; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Present capabilities of the NASA CARES/Life (Ceramic Analysis and Reliability Evaluation of Structures/Life) code include probabilistic life prediction of ceramic components subjected to fast fracture, slow crack growth (stress corrosion), and cyclic fatigue failure modes. Currently, this code has the capability to compute the time-dependent reliability of ceramic structures subjected to simple time-dependent loading. For example, in slow crack growth (SCG) type failure conditions CARES/Life can handle the cases of sustained and linearly increasing time-dependent loads, while for cyclic fatigue applications various types of repetitive constant amplitude loads can be accounted for. In real applications applied loads are rarely that simple, but rather vary with time in more complex ways such as, for example, engine start up, shut down, and dynamic and vibrational loads. In addition, when a given component is subjected to transient environmental and or thermal conditions, the material properties also vary with time. The objective of this paper is to demonstrate a methodology capable of predicting the time-dependent reliability of components subjected to transient thermomechanical loads that takes into account the change in material response with time. In this paper, the dominant delayed failure mechanism is assumed to be SCG. This capability has been added to the NASA CARES/Life (Ceramic Analysis and Reliability Evaluation of Structures/Life) code, which has also been modified to have the ability of inter-

facing with commercially available FEA codes executed for transient load histories. An example involving a ceramic exhaust valve subjected to combustion cycle loads is presented to demonstrate the viability of this methodology and the CARES/Life program.
Author
Ceramics; Crack Propagation; Fatigue Life; Life (Durability); Loads (Forces); Reliability; Cracking (Fracturing)

20010021110 NASA Langley Research Center, Hampton, VA USA
Characterization of Pressure Sensitive Paint Intrusiveness Effects on Aerodynamic Data
Amer, Tahani R., NASA Langley Research Center, USA; Liu, Tianshu, NASA Langley Research Center, USA; Oglesby, Donald M., Science and Technology Corp., USA; [2001]; 18p; In English; 39th; Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2001-0556; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

One effect of using pressure sensitive paint (PSP) is the potential intrusiveness to the aerodynamic characteristics of the model. The paint thickness and roughness may affect the pressure distribution. and therefore, the forces and moments on the wind tunnel model. A study of these potential intrusive effects was carried out at NASA Langley Research Center where a series of wind tunnel tests were conducted using the Modem Design of Experiments (MDOE) test approach. The PSP effects on the integrated forces were measured on two different models at different test conditions in both the Low Turbulence Pressure Tunnel (LTPT) and the Unitary Plan Wind Tunnel (UPWT) at Langley. The paint effect was found to be very small over a range of Reynolds numbers, Mach numbers and angles of attack. This is due to the very low surface roughness of the painted surface. The surface roughness, after applying the NASA Langley developed PSP, was lower than that of the clean wing. However, the PSP coating had a localized effects on the pressure taps, which leads to an appreciable decrease in the pressure tap reading.
Author
Aerodynamic Characteristics; Paints; Pressure Distribution; Wind Tunnel Tests; Aircraft Models; Sensitivity

20010021135 NASA Langley Research Center, Hampton, VA USA
The Role of Molecular Weight and Temperature on the Elastic and Viscoelastic Properties of a Glassy Thermoplastic Polyimide
Nicholson, Lee M., NASA Langley Research Center, USA; Whitley, Karen S., NASA Langley Research Center, USA; Gates, Thomas S., NASA Langley Research Center, USA; February 2001; 22p; In English
Contract(s)/Grant(s): RTOP 706-13-31-02
Report No.(s): NASA/TM-2001-210664; L-18056; NAS 1.15:210664; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mechanical testing of the elastic and viscoelastic response of an advanced thermoplastic polyimide (LaRC-SI) with known variations in molecular weight was performed over a range of temperatures below the glass transition temperature. The notched tensile strength was shown to be a strong function of both molecular weight and temperature, whereas stiffness was only a strong function of temperature. A critical molecular weight was observed to occur at a weight average molecular weight of M, approx. 22,000 g/mol below which, the notched tensile strength decreases rapidly. This critical molecular weight transition is temperature-independent. Low, molecular weight materials tended to fail in a brittle manner, whereas high molecular weight materials exhibited ductile failure. Furthermore, low molecular weight materials have increased creep compliance and creep compliance rate, and are more sensitive to temperature than the high molecular weight materials. At long timescales (less than 1100 hours) physical aging serves to significantly decrease the creep compliance and creep rate of all the materials tested. Low molecular weight materials are less influenced by the effects of physical aging.
Author
Viscoelasticity; Thermoplasticity; Polyimides; Performance Tests; Low Molecular Weights; Elastic Properties

20010021351 Osaka City Univ., Faculty of Engineering, Japan
Changes in Pore Structure and Enhanced Durability of Concrete by The Use of Permeable Forms
Tatemarsu, Kazuhiko, Osaka City Univ., Japan; Ishihara, Seiichirou, Asanuma Corp., Japan; Yamada, Masaru, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 101-110; In English; Copyright; Avail: Issuing Activity

Permeable forms are designed to drain excess water contained in the concrete immediately after their placement. Removal of excess water not only decreases the water-cement ratio of the surface concrete, but increases the density of the concrete, and eventually enhances its durability. However, few studies focus on the characteristics of pore structure, namely, the relationship between changes in the volume and distribution of capillary pore and the durability of concrete by the use of permeable forms.

In this study, investigations were made paying attention to changes in pore structure on past data obtained from tests conducted on permeable forms. The data included pore size distribution, cement volume distribution, depth of accelerated neutralization, salt infiltration and surface strength. The investigations led to the following findings: 1) Use of permeable forms decrease the percentage of pore volume, especially that ranging between 50 nm and 2 micrometer. 2) In the case of pore size ranging between 50 nm and 2 micrometer, correlations can be seen between the decrease in pore volume and such properties as neutralization, chloride ion penetration and surface strength.
Author
Permeability; Drainage; Water; Porosity; Leakage; Durability

20010021367 Osaka City Univ., Faculty of Engineering, Japan
Organic Thin Film El Device With Plasma-Polymerized N-Ethylcarbazole as Hole Transport Layer
Kurajou, Masayuki, Osaka City Univ., Japan; Zhao, Ran, Osaka City Univ., Japan; Tanaka, Kenji, Osaka City Univ., Japan; Maekawa, Yoshiharu, Osaka City Univ., Japan; Kusabiraki, Minoru, Osaka City Univ., Japan; Aozasa, Masao, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 1-5; In English; Copyright; Avail: Issuing Activity

We fabricated an organic EL device with plasma-polymerized N-ethylcaxbazole(PPCz) as a hole transport layer and 8-hydroxyquinoline aluminum(Alq3) as an emission and electron transport layer. Optical gap and ionization potential of PPCz and luminance characteristics of the device were investigated.
Author
Thin Films; Plasma Display Devices; Plasmas (Physics); Flat Panel Displays

20010021529 Argonne National Lab., IL USA
Increased medium-range order in amorphous silicon with increased substrate temperature
Voyles, P. M.; Gerbi, J. E.; Treacy, M. M. J.; Gibson, J. M.; Aberlson, J. R.; Aug. 15, 2000; 7p; In English
Report No.(s): DE00-761273; ANL/MSD/CP-102632; No Copyright; Avail: Department of Energy Information Bridge

Using fluctuation electron microscopy, the authors have measured the medium-range order of magnetron sputtered silicon thin films as a function of substrate temperature from the amorphous to polycrystalline regimes. They find a smooth increase in the medium-range order of the samples, which they interpret in the context of the paracrystalline structural model as an increase in the size of and/or volume fraction occupied by the paracrystalline grains. These data are counter to the long-standing belief that there is a sharp transition between amorphous and polycrystalline structures as a function of substrate temperature.
NTIS
Amorphous Silicon; Substrates; Silicon Films; Magnetron Sputtering

20010021530 Argonne National Lab., IL USA
Investigation of spectral radiation heat transfer and NO(x) emission in a glass furnace
Golchert, B.; Zhou, C. Q.; Chang, S. L.; Petrick, M.; Aug. 02, 2000; 9p; In English
Report No.(s): DE00-761261; ANL/ES/CP-102494; No Copyright; Avail: Department of Energy Information Bridge

A comprehensive radiation heat transfer model and a reduced NOx kinetics model were coupled with a computational fluid dynamics (CFD) code and then used to investigate the radiation heat transfer, pollutant formation and flow characteristics in a glass furnace. The radiation model solves the spectral radiative transport equation in the combustion space of emitting and absorbing media, i.e., CO2, H2O, and soot and emission/reflection from the furnace crown. The advanced numerical scheme for calculating the radiation heat transfer is extremely effective in conserving energy between radiation emission and absorption. A parametric study was conducted to investigate the impact of operating conditions on the furnace performance with emphasis on the investigation into the formation of NOx.
NTIS
Radiative Heat Transfer; Nitrogen Oxides; Emission

20010021532 Sandia National Labs., Albuquerque, NM USA
Expancel Foams: Fabrication and Characterization of a New Reduced Density Cellular Material for Structural Applications
Whinnery, L.; Goods, S.; Even, B.; Aug. 01, 2000; 31p; In English
Report No.(s): DE00-760518; SAND2000-8217; No Copyright; Avail: Department of Energy Information Bridge

This study was initiated to produce a low-density centering medium for use in experiments investigating the response of materials to shock-loading. While the main drivers for material selection were homogeneity, dimensional stability, performance and

cost, other secondary requirements included fine cell size, the ability to manufacture 5--10 cm-sized parts and an extremely compressed development time. The authors chose a non-traditional methodology using a hollow, expandable, polymeric microballoon material system called Expancel(reg-sign). These microballoons are made from a copolymer of polyacrylonitrile (PAN) and polymethacrylonitrile (PMAN) and use iso-pentane as the blowing agent. The average diameter (by volume) of the unexpanded powder is approximately 13 (micro)m, while the average of the expanded powder is 35--55 (micro)m, with a few large microballoons approaching 150--200 p.m. A processing method was developed that established a pre-mixed combination of unexpanded and expanded Expancel at a ratio such that the tap (or vibration) density of the mixed powders was the same as that desired of the final part. Upon heating above the tack temperature of the polymer, this zero-rise approach allowed only expansion of the unexpanded powder to fill the interstices between the pre-expanded balloons. The mechanical action of the expanding powder combined with the elevated processing temperature yielded flee-standing and mechanically robust parts. Although mechanical properties of these foams were not a key performance requirement, the data allowed for the determination of the best temperature to heat the samples. Processing the foam at higher temperatures enhanced both modulus and strength. The maximum allowable temperature was limited by dimensional stability and shrinkback considerations. Tomographic analysis of foam billets revealed very flat density profiles. Parts of any density between the low density expanded powder (approximately 0.013 g/cm(exp 3)) and the higher density unexpanded powder (approximately 0.5 g/cm(exp 3)) can be produced using this technique. The extremely wide range of accessible densities, ease of processing, relatively inexpensive materials, uniformity of the density, scaleable nature of the process should make this technology highly competitive for a variety of Defense Programs and commercial applications.
NTIS
Foams; Fabrication; Structural Design

20010021679 NASA Langley Research Center, Hampton, VA USA
Polyimide-Silica Hybrids Containing Novel Phenylethynyl Imide Silanes as Coupling Agents for Surface-Treated Titanium Alloy
Park, C., National Academy of Sciences - National Research Council, USA; Lowther, S. E., NASA Langley Research Center, USA; Smith, J. G., Jr., NASA Langley Research Center, USA; Connell, J. W., NASA Langley Research Center, USA; Hergenrother, P. M., NASA Langley Research Center, USA; SaintClair, T. L., NASA Langley Research Center, USA; International Journal of Adhesion and Adhesives; [2000]; ISSN 0143-7496; Volume 20, pp. 457-465; In English; Copyright; Avail: Issuing Activity

Polyimide-silica hybrids composed of an organic precursor containing a novel phenylethynyl imide silane and an inorganic precursor were evaluated as an adhesion-promoting interphase between surface-treated titanium alloy and a phenylethynyl-containing imide adhesive. The phenylethynyl groups present in the organic precursor, either as a pendent or end group, can bond chemically with a phenylethynyl-containing imide adhesive during processing, while the silane groups of the organic precursor would react chemically with the inorganic precursor. In addition, the inorganic precursor is able to react with the titanium alloy to form a stable bond with the metal oxide. Bond strength and durability were evaluated by single lap shear tests at various conditions. Lap shear specimens exhibited predominantly cohesive failure after a 3-d water boil with 92% retention of the initial room temperature strength. Morphology and chemical composition of the hybrid interphase were investigated with scanning electron microscopy, X-ray photoelectron spectroscopy, and Auger electron spectroscopy, which revealed development of a silicon-gradient, hybrid structure between the metal substrate and the adhesive.
Author
Adhesives; Chemical Composition; Durability; Imides; Polyimides; Silanes

20010021733 Sandia National Labs., Albuquerque, NM USA
Uncertainty Analysis of Decomposing Polyurethane Foam
Hobbs, Michael L., Sandia National Labs., USA; Romero, Vicente J., Sandia National Labs., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 37-45; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Sensitivity/uncertainty analyses are necessary to determine where to allocate resources for improved predictions in support of our nation’s nuclear safety mission. Yet, sensitivity/uncertainty analyses are not commonly performed on complex combustion models because the calculations are time consuming, CPU intensive, nontrivial exercises that can lead to deceptive results. To illustrate these ideas, a variety of sensitivity/uncertainty analyses were used to determine the uncertainty associated with thermal decomposition of polyurethane foam exposed to high radiative flux boundary conditions. The polyurethane used in this study is a rigid closed-cell foam used as an encapsulant. Related polyurethane binders such as Estane are used in many energetic materials of interest to the JANNAF community. The complex, finite element foam decomposition model used in this study has 25 input parameters that include chemistry, polymer structure, and thermophysical properties. The response variable was selected as the

steady-state decomposition front velocity calculated as the derivative of the decomposition front location versus time. An analytical mean value sensitivity/uncertainty (MV) analysis was used to determine the standard deviation by taking numerical derivatives of the response variable with respect to each of the 25 input parameters. Since the response variable is also a derivative, the standard deviation was essentially determined from a second derivative that was extremely sensitive to numerical noise. To minimize the numerical noise, 50-micrometer element dimensions and approximately 1-msec time steps were required to obtain stable uncertainty results. As an alternative method to determine the uncertainty and sensitivity in the decomposition front velocity, surrogate response surfaces were generated for use with a constrained Latin Hypercube Sampling (LHS) technique. Two surrogate response surfaces were investigated: 1) a linear surrogate response surface (LIN) and 2) a quadratic response surface (QUAD). The LHS techniques do not require derivatives of the response variable and are subsequently relatively insensitive to numerical noise. to compare the LIN and QUAD methods to the MV method, a direct LHS analysis (DLHS) was performed using the full grid and timestep resolved finite element model. The surrogate response models (LIN and QUAD) are shown to give acceptable values of the mean and standard deviation when compared to the fully converged DLHS model.
Author
Boundary Conditions; Decomposition; Finite Element Method; Mathematical Models; Polyurethane Foam; Polyurethane Resins; Radiation Protection; Thermal Decomposition; Thermophysical Properties

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PROPELLANTS AND FUELS

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

20010019902 Illinois Univ. at Urbana-Champaign, Urbana, IL USA
Femtosecond Shock Wave Dynamics of Insensitive Energetic Materials ***Final Report, 15 Jan. 1997 - 14 Jan. 2000***
Dlott, Dana D., Illinois Univ. at Urbana-Champaign, USA; [2000]; 13p; In English
Contract(s)/Grant(s): F49620-97-1-0056
Report No.(s): AD-A385456; AFRL-SR-BL-TR-00-0693; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The goal of this project is to develop a fundamental understanding, at the molecular level, of the initial events occurring during the first picoseconds of impact initiation of energetic materials. It is believed this fundamental research will lead to a clearer picture of the factors which determine the sensitivity of energetic materials to shock impact initiation. Understanding and perhaps controlling sensitivity will result in safer explosives. In a larger sense, the problem of molecular level understanding of chemical and physical phenomena involved in impact processes has much wider and more general implications for such relevant processes as mechanical failure, crack propagation, lubrication and wear, etc. At the present time experimental techniques to study these problems are lacking. by developing such techniques with the goal of understanding impact initiation of energetic materials, these other areas may be addressed as well.
DTIC
Shock Waves; Explosives; Failure; Cracks; Impact Resistance

20010019904 Army Research Lab., Aberdeen Proving Ground, MD USA
Uniaxial Compression of TNT and Comp-B at Strain Rates of 0.1, 1.0, 10.0, and 100.0 s(exp -1) ***Final Report, Apr. - Oct. 1999***
Leadore, Michael G., Army Research Lab., USA; Pierce, Frederick B., Army Research Lab., USA; October 2000; 38p; In English
Contract(s)/Grant(s): DA Proj. 1L1-61102-AH-43
Report No.(s): AD-A385724; ARL-TR-2359; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Two lots of TNT and Comp-B explosives were tested in uniaxial compression at strain rates of 0.1, 1.0, 10.0, and 100.0/s. The materials were tested at 21 C to an end strain of 80%. The stress at failure, strain at failure, compressive modulus, failure modulus, incremental energy density, and the fracture assessment values were recorded for each test.
DTIC
Ammunition; Axial Compression Loads; Trinitrotoluene; Strain Rate

20010020044 Northwestern Univ., Dept. of Chemical Engineering, Evanston, IL USA

Novel Approaches for the Preparation of Sulfur-Tolerant Three-Way Catalysts ***Annual Report, 15 Aug. 1999 - 4 Aug. 2000***

Yezerets, A.; Kung, M. C.; Kozlov, A.; Kung, H. H.; Andersen, P.; 2000; 24p; In English

Report No.(s): PB2001-101425; CRC-E-7a-4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Improving the present performance of the three-way catalyst in the presence of SO2 to meet the new vehicular standard is a challenging task. One possible approach is to enhance the intrinsic activity of the catalyst by modifying the surface and bulk properties of Al2O3. Based on previous work and published literature reports, in this study, they have hypothesized that the use of Al2O3, prepared by hydrolysis of aluminum isopropoxide in the presence of 2-methylpentane-2-4-diol (MPD), may result in more active three-way catalysts. In the first year of this project, they demonstrated that a catalyst with 1% Pd on CeO(2-) Al2O3 (MPD method) has catalytic activity comparable to a commercial catalyst supplied by Johnson Matthey under laboratory testing conditions. In order to improve the activity of this catalyst, it is necessary to relate the preparation variables to the surface and bulk properties of MPD-Al2O3. Thus, the objective of work in the second year was to understand the effect of preparation variables of alumina, and extend it to the synthesis of the three-way catalyst.

NTIS

Catalysts; Pollution Control; Cerium Compounds; Sulfur Dioxides; Catalytic Activity; Aluminum Oxides

20010020145 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Evaluation of Thermal Stability Improving Additives for Jet Fuel in Both Laminar and Turbulent Flow Test Units

Colbert, John E.; Nowack, Clarence J.; Sep. 2000; 24p; In English; Presented at the IASH 2000, International Conference on Stabllity and Handling of Liquid Fuels (7th), Graz, Austria, Sep 24-29, 2000.

Report No.(s): AD-A385772; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

NAVAIRSYSCOM has evaluated the individual benefits of 3 different thermal stability improving additives (TSIAs) in jet fuel using 2 separate, small-scale test devices - one laminar flow and the other turbulent. Both systems pump fuel at constant flowrate and use stainless steel tubes that are heated to maintain the bulk fuel at a constant, elevated test temperature. The laminar device has an inside diameter of 0.1 in. (0.262 cm) and an approximate Reynolds No. of 200, whereas the turbulent has an inside diameter of 0.01 in. (0.0254 cm) and a Reynolds No. of 13,000. The results have shown that all 3 TSIAs, when test at their maximum dose levels, reduce the amount of thermal deposits (measured via carbon burnoff) in both flow regimes for 3 different base fuels tested. Both units rank the level of thermal stability in the same order for the 3 baseline fuels tested. In addition, both devices show that Betz 8Q462. is the most effective additive of the 3 tested, with MDA demonstrating almost similar performance in controlling deposit formation. Furthermore, Betz 8Q406 was not as effective as the 2 other additives, but a change in its formulation by the addition of 2 mg/l MDA (to produce 8Q462) greatly improved its performance in both test devices, but most notably in the laminar unit. However, one exception had occurred when MDA was added to one of the test fuels (Tank 20122), which caused an increase in deposition compared to the neat fuel when tested in the turbulent unit. Overall, the combination of the accelerated test conditions in the turbulent unit of higher bulk fuel temperate, higher flowrate, turbulent flow (i.e., flatter temperature profile across the tub ID), and shorter residence time make this a more severe test when compared to the laminar device.

DTIC

Jet Engine Fuels; Thermal Stability; Additives; Turbulent Flow

20010020150 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne Australia

A Laboratory Study on the Failure of Petroleum, Oil and Lubricant (POL) Fuel Tank

Lee, B., Defence Science and Technology Organisation, Australia; Egglestone, G. T., Defence Science and Technology Organisation, Australia; Robinson, D. J., Defence Science and Technology Organisation, Australia; Jul. 2000; 20p; In English; Original contains color plates

Report No.(s): AD-A385784; DSTO-TN-0300; DODA-AR-011-541; Copyright; Avail: Defense Technical Information Center (DTIC)

The ADF has been using collapsible Petroleum, Oil and Lubricant (POL) tanks in Bougainville, Papua New Guinea for storage of diesel fuel. During usage, leakage was reported from the top surface of the tanks that were coated with a polyester urethane. The work detailed in this report covers an examination of the failed material and potential mechanisms to replicate the failure in the laboratory. Hydrolysis of the polyurethane coating was found to be the dominant cause of failure, with possible contributory effects from the manufacturing process.

DTIC

Fuel Tanks; Storage Tanks; Disintegration; Collapse; Expandable Structures; Polyurethane Resins; Failure; Laboratories; Research

20010020155 NASA Johnson Space Center, Houston, TX USA

Helium Evolution from the Transfer of Helium Saturated Propellant in Space

Nguyen, Bich N., Boeing Reusable Space Station, USA; [2000]; 22p; In English; 21st; Space Simulation Conferenc, 23 Oct. 2000, Annapolis, MD, USA

Contract(s)/Grant(s): NAS15-10000; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Helium evolution from the transfer of helium saturated propellant in space is quantified to determine its impact from creating a two-phase mixture in the transfer line. The transfer line is approximately 1/2 inch in diameter and 2400 inches in length comprised of the Fluid Interconnect System (FICS), the Orbiter Propellant Transfer System (OPTS) and the International Space Station (ISS) Propulsion Module (ISSPM). The propellant transfer rate is approximately two to three gallons per minute, and the supply tank pressure is maintained at approximately 250 psig.

Author

Helium; Propellant Transfer; Gas Evolution

20010020167 National Inst. of Standards and Technology, Office of Weights and Measures Program, Gaithersburg, MD USA

Uniform Laws and Regulations in the Areas of Legal Metrology and Engine Fuel Quality as Adopted by the 85th National Conference on Weights and Measures, 2000 Handbook

Coleman, T., National Inst. of Standards and Technology, USA; Grimes, T. L., National Inst. of Standards and Technology, USA; Nov. 2000; 246p; In English

Report No.(s): PB2001-102174; NIST/HB-130-2001; No Copyright; Avail: National Technical Information Service (NTIS)

Table of Contents: Foreword; Committee Members; 2000 Amendments; Introduction; Uniformity of Laws and Regulations; Summary of State Laws and Regulations in Weights and Measures; Uniform Laws (Uniform Weights and Measures Law, Uniform Weighmaster Law, Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Inspection Law); Uniform Regulations; (Uniform Packaging and Labeling Regulation, Uniform Regulation for the Method of Sale of Commodities, Uniform Unit Pricing Regulation, Uniform Regulation for the Voluntary Registration of Servicepersons and Service Agencies for Commercial Weighing and Measuring Devices, Uniform Open Dating Regulation; Uniform Regulation for National Type Evaluation; Uniform Engine Fuels, Petroleum Products, and Automotive Lubricants Regulation); Examination Procedure for Price Verification; Interpretations and Guidelines; Index.

NTIS

Handbooks; Weight Measurement; Law (Jurisprudence); Metrology; Fuels

20010020232 NASA Marshall Space Flight Center, Huntsville, AL USA

PROPULSE 980: A Hydrogen Peroxide Enrichment System

Boxwell, Robert, NASA Marshall Space Flight Center, USA; Bromley, G., NASA Marshall Space Flight Center, USA; Wanger, Robert, NASA Marshall Space Flight Center, USA; Pauls, Dan, NASA Marshall Space Flight Center, USA; Maynard, Bryon, NASA Marshall Space Flight Center, USA; McNeal, Curtis, NASA Marshall Space Flight Center, USA; [2000]; 3p; In English; 3rd; International Hydrogen Peroxide Propulsion, 13 Nov. 2000, Gulf Port, MS, USA

Contract(s)/Grant(s): NAS9-8040; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The PROPULSE 980 unit is a transportable processing plant that enriches aerospace grade hydrogen peroxide from 90% to 98% final concentration. The unit was developed by Degussa-H Is, in cooperation with Orbital, NASA Marshall Space Center, and NASA Stennis Space Center. The system is a self-contained unit that houses all of the process equipment, instrumentation and controls to perform the concentration operation nearly autonomously. It is designed to produce non-bulk quantities of 98% hydrogen peroxide. The enrichment unit design also maintains system, personnel and environmental safety during all aspects of the enrichment process and final product storage. As part of the Propulse 980 checkout and final buyoff, it will be disassembled at the Degussa-H Is Corporation plant in Theodore, AL, transported to the Stennis Space Center, reassembled and subjected to a series of checkout tests to verify design objectives have been met. This paper will summarize the basic project elements and provide an update on the present status of the project.

Author

Spacecraft Equipment; Concentrators; Project Planning

20010021176 NASA Marshall Space Flight Center, Huntsville, AL USA

A Cryogenic Propellant Production Depot for Low Earth Orbit

Potter, Seth D., Boeing Co., USA; Henley, Mark W., Boeing Co., USA; Gutierrez, Sonia, Boeing Co., USA; Fikes, John, NASA Marshall Space Flight Center, USA; Carrington, Connie, NASA Marshall Space Flight Center, USA; Smitherman, David, NASA Marshall Space Flight Center, USA; Gerry, Mark, NASA Marshall Space Flight Center, USA; Sutherlin, Steve, Sverdrup Technology, Inc., USA; Beason, Phil, Sverdrup Technology, Inc., USA; [2001]; 1p; In English; International Space Development, 24-28 May 2001, Albuquerque, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The cost of access to space beyond low Earth orbit can be lowered if vehicles can refuel in orbit. The power requirements for a propellant depot that electrolyzes water and stores cryogenic oxygen and hydrogen can be met using technology developed for space solar power. A propellant depot is described that will be deployed in a 400 km circular equatorial orbit, receive tanks of water launched into a lower orbit from Earth by gun launch or reusable launch vehicle, convert the water to liquid hydrogen and oxygen, and store up to 500 metric tonnes of cryogenic propellants. Orbital maneuvering vehicles will transfer the Earth-launched propellant tanks from the lower orbit to the depot orbit. The propellant stored in the depot can support transportation from low Earth orbit to geostationary Earth orbit, the Moon, LaGrange points, Mars, etc. The propellant tanks on the depot are modified versions of those used in the Delta IV-Heavy launch vehicle. The tanks are configured in an in-line gravity-gradient configuration to minimize drag and settle the propellant. Temperatures can be maintained by body-mounted radiators; these will also provide some shielding against orbital debris. Power is supplied by a pair of solar arrays mounted perpendicular to the orbital plane, which rotate once per orbit to track the Sun. The majority of the power will be used to run the electrolysis system. Technology needed for an orbiting propellant depot can be tested and demonstrated in the near-term on the ground, on a Shuttle-deployed free-flyer, and on the International Space Station. Further along, an orbital depot can be deployed that stores liquid hydrogen and oxygen launched from Earth, to be followed by a full conversion and storage depot.

Author

Cryogenic Rocket Propellants; Refueling; Orbital Servicing; Space Platforms; Large Space Structures

20010021516 California Univ., Coll. of Engineering, Riverside, CA USA

Evaluation of a Process to Convert Biomass to Methanol Fuel ***Final Report, Jun. 1995 - Aug. 2000***

Norbeck, J. M.; Johnson, K.; Oct. 2000; 246p; In English

Report No.(s): PB2001-101231; EPA/600/R-00/092; No Copyright; Avail: Department of Energy Information Bridge

The report gives results of a review of the design of a reactor capable of gasifying approximately 50 lb/hr of biomass for a pilot-scale facility to develop, demonstrate, and evaluate the Hynol Process, a high-temperature, high-pressure method for converting biomass into methanol fuel. The report also discusses design modifications and gives preliminary results of operating the facility. Significant flaws in the initial design were discovered and corrected.

NTIS

Biomass; Methyl Alcohol; Energy Conversion

20010021518 National Renewable Energy Lab., Golden, CO USA

Biofuels News, Volume 3

Brown, H.; Aug. 15, 2000; 4p; In English

Report No.(s): DE00-763409; NREL/BR-580-28546; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This is the Newsletter for DOE Biofuels Program. Articles are presented on collection and use of corn stover for bioethanol production, the state workshop program on ethanol, and a subcontract to Generator for improvement of cellulase enzyme production.

NTIS

Production Planning; Corn; Ethyl Alcohol

20010021550 NASA Marshall Space Flight Center, Huntsville, AL USA

Cryogenic Propellant Long-term Storage With Zero Boil-off

Hedayat, A., Sverdrup Technology, Inc., USA; Hastings, L. J., NASA Marshall Space Flight Center, USA; Sims, J., NASA Marshall Space Flight Center, USA; Plachta, D. W., NASA Glenn Research Center, USA; [2001]; 1p; In English; Cryogenic Engineering Conference and International Cryogenic Materials Conference, 16-20 Jul. 2001, Madison, WI, USA

Contract(s)/Grant(s): NAS8-40836; No Copyright; Avail: Issuing Activity; Abstract Only

Significant boil-off losses of cryogenic propellant storage systems in long-duration space mission applications result in additional propellant and large tanks. The zero boil-off (ZBO) concept consists of an active cryo-cooling system integrated with tradi-

tional passive thermal insulation. The potential mass reductions with the ZBO concept are Substantial; therefore, further exploration through technology programs has been initiated within NASA. A large-scale demonstration of the ZBO concept has been devised utilizing the Marshall Space Flight Center (MSFC) Multipurpose Hydrogen Test Bed (MHTB) along with a cryo-cooler unit. The cryo-cooler with the MHTB and spraybar recirculation/mixer system in a manner that enables thermal energy removal at a rate that equals the total tank heat leak. The liquid hydrogen is withdrawn from the tank, passed through a heat exchanger, and then the chilled liquid is sprayed back into the tank through a spraybar. The test series will be performed over a 30-40 day period. Tests will be conducted at multiple fill levels and various mixer operational cycles to demonstrate concept viability and to provide benchmark data to be used in analytical model development. In this paper. analytical models for heat flows through the MHTB tank, cryo-cooler performance. and spraybar performance will be presented.
Author
Cryogenics; Propellant Storage; Cooling Systems; Mathematical Models; Propellant Tanks; Evaporation

20010021611 Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, Washington, DC USA
Quarterly Coal Report ***Quarterly Report, Jan. - Mar. 2000***
Young, P.; Mar. 2000; 102p; In English
Report No.(s): PB2001-102487; DOE/EIA-0121(2000/1Q); No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

The Quarterly Coal Report (QCR) provides comprehensive information about U.S. coal production, distribution, exports, imports, receipts, prices, consumption, and stocks to a wide audience, including Congress, Federal and State agencies, the coal industry, and the general public. Coke production, consumption, distribution, imports, and exports data are also provided. The data presented in the QCR are collected and published by the Energy Information Administration (EIA) to fulfill data collection and dissemination responsibilities as specified in the Federal Energy Administration Act of 1974 (Public Law 93-275), as amended. This report presents detailed quarterly data for January through March 2000 and aggregated quarterly historical data for 1994 through the first quarter of 2000. Appendix A displays, from 1994 on, detailed quarterly historical coal imports data, as specified in Section 202 of the Energy Policy and Conservation Amendments Act of 1985 (Public Law 99-58).
NTIS
Energy Policy; Coal; Fuel Consumption; Supplying; Demand (Economics)

20010021612 Energy Information Administration, Office of Coal, Nuclear, Electric and Alternate Fuels, Washington, DC USA
Quarterly Coal Report ***Quarterly Report, Apr. - Jun. 2000***
Jun. 2000; 104p; In English
Report No.(s): PB2001-102488; DOE/EIA-0121(2000/2Q); UC-950; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

The Quarterly Coal Report (QCR) provides comprehensive information about U.S. coal production, distribution, exports, imports, receipts, prices, consumption, and stocks to a wide audience, including Congress, Federal and State agencies, the coal industry, and the general public. Coke production, consumption, distribution, imports, and exports data are also provided. The data presented in the QCR are collected and published by the Energy Information Administration (EIA) to fulfill data collection and dissemination responsibilities as specified in the Federal Energy Administration Act of 1974 (Public Law 93-275), as amended. This report presents detailed quarterly data for April through June 2000 and aggregated quarterly historical data for 1994 through the second quarter of 2000. Appendix A displays, from 1994 on, detailed quarterly historical coal imports data, as specified in Section 202 of the Energy Policy and Conservation Amendments Act of 1985 (Public Law 99-58).
NTIS
Coal; Production; Fuel Consumption; Supplying; Demand (Economics)

20010021730 Joint Warfare Analysis Center, Dahlgren, VA USA
Simulating the Composite Propellant Manufacturing Process
Williamson, Suzanne, Joint Warfare Analysis Center, USA; Love, Gregory, Project Performance Corp., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 81-90; In English; 1st; Modeling and Simulation, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

There is a strategic interest in understanding how the propellant manufacturing process contributes to military capabilities outside the United States. The paper will discuss how system dynamics (SD) has been applied to rapidly assess the capabilities and vulnerabilities of a specific composite propellant production complex. These facilities produce a commonly used solid propellant with military applications. The authors will explain how an SD model can be configured to match a specific production facility followed by a series of scenarios designed to analyze operational vulnerabilities. by using the simulation model to rapidly analyze

operational risks, the analyst gains a better understanding of production complexities. There are several benefits of developing SD models to simulate chemical production. SD is an effective tool for characterizing complex problems, especially the production process where the cascading effect of outages quickly taxes common understanding. by programming expert knowledge into an SD application, these tools are transformed into a knowledge management resource that facilitates rapid learning without requiring years of experience in production operations. It also permits the analyst to rapidly respond to crisis situations and other time-sensitive missions. Most importantly, the quantitative understanding gained from applying the SD model lends itself to strategic analysis and planning.
Author
Composite Propellants; Manufacturing; Simulation; Solid Propellants

29
SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see 84 Law, Political Science and Space Policy.

20010019995 NASA Marshall Space Flight Center, Huntsville, AL USA
An Explanation of the Effects of Gravity on the Crystallization of ZBLAN Glass
Tucker, Dennis S., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 52nd; International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

The effects of gravity on crystallization of ZBLAN glasses have been studied utilizing NASA's KC-135 aircraft and a sounding rocket. Fibers were heated to the crystallization temperature in unit and reduced gravity. The fibers processed in unit gravity exhibited crystallization, while fibers processed in reduced gravity showed no signs of crystallization. An explanation based on shear thinning of liquids is presented to explain these results.
Author
Crystallization; Gravitational Effects; Microgravity; Experimentation

20010020028 NASA Marshall Space Flight Center, Huntsville, AL USA
Microgravity Propellant Tank Geyser Analysis and Prediction
Thornton, Randall J., NASA Marshall Space Flight Center, USA; Hochstein, John I., Memphis Univ., USA; [2001]; 13p; In English; 39th; Aerospace Science, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2001-1132; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

An established correlation for geyser height prediction of an axial jet inflow into a microgravity propellant tank was analyzed and an effort to develop an improved correlation was made. The original correlation, developed using data from ethanol flow in small-scale drop tower tests, uses the jet-Weber number and the jet-Bond number to predict geyser height. A new correlation was developed from the same set of experimental data using the jet-Weber number and both the jet-Bond number and tank-Bond number to describe the geyser formation. The resulting correlation produced nearly a 40% reduction in geyser height predictive error compared to the original correlation with experimental data. Two additional tanks were computationally modeled in addition to the small-scale tank used in the drop tower testing. One of these tanks was a 50% enlarged small-scale tank and the other a full-scale 2 m radius tank. Simulations were also run for liquid oxygen and liquid hydrogen. Results indicated that the new correlation outperformed the original correlation in geyser height prediction under most circumstances. The new correlation has also shown a superior ability to recognize the difference between flow patterns II (geyser formation only) and III (pooling at opposite end of tank from the bulk fluid region).
Author
Oxygen; Propellant Tanks; Geysers; Predictions; Liquid Hydrogen; Liquid Oxygen

20010020259 NASA Marshall Space Flight Center, Microgravity Research Program Office, Huntsville, AL USA
The US Microgravity Science Program
Henderson, Robin, NASA Marshall Space Flight Center, USA; Jan. 08, 2001; 17p; In English; 39th; AIAA Aerospace Sciences Meeting and Exhibit, 8 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2001-0179; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contents include the following: space science; earth science; human exploration and development of space; aerospace technology; and biological physical research; microgravity research strategic; microgravity research; space shuttle flight operations; and international space station preparation
CASI
Earth Sciences; Space Transportation System Flights; Microgravity

20010020284 Boeing Co., Space and Communications Group, Huntsville, AL USA
Lessons Learned Using COTS Electronics for the International Space Station Radiation Environment
Blumer, John H., Boeing Co., USA; [2001]; 8p; In English; Space Technology and Applications, 11 Feb. 2001, Albuquerque, NM, USA
Contract(s)/Grant(s): NAS8-50000; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The mantra of 'Faster, Better, Cheaper' has to a large degree been interpreted as using Commercial Off-the-Shelf (COTS) components and/or circuit boards. One of the first space applications to actually use COTS in space along with radiation performance requirements was the Expedite the Processing of Experiments to Space Station (EXPRESS) Rack program, for the International Space Station (ISS). In order to meet the performance, cost and schedule targets, military grade Versa Module Eurocard (VME) was selected as the baseline design for the main computer, the Rack Interface Controller (RIC). VME was chosen as the computer backplane because of the large variety of military grade boards available, which were designed to meet the military environmental specifications (thermal, shock, vibration, etc.). These boards also have a paper pedigree in regards to components. Since these boards exceeded most ISS environmental requirements, it was reasoned using COTS mid-grade VME boards, as opposed to designing custom boards could save significant time and money. It was recognized up front the radiation environment of ISS, while benign compared to many space flight applications, would be the main challenge to using COTS. Thus in addition to selecting vendors on how well their boards met the usual performance and environmental specifications, the board's parts lists were reviewed on how well they would perform in the ISS radiation environment. However, issues with verifying that the available radiation test data was applicable to the actual part used, vendor part design changes and the fact most parts did not have valid test data soon complicated board and part selection in regards to radiation.
Author
Fabrication; Design Analysis; Technology Utilization

20010020393 Ohio State Univ., Dept. of Chemistry, Columbus, OH USA
Reverse Micelle Based Synthesis of Microporous Materials in Microgravity ***Final Report***
Dutta, Prabir K., Ohio State Univ., USA; [2001]; 5p; In English
Contract(s)/Grant(s): NAG8-1267; OSURF Proj. 732378; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Microporous materials include a large group of solids of varying chemical composition as well as porosity. These materials are characterized by channels and cavities of molecular dimensions. The framework structure is made up of interconnecting T-O-T' bonds, where T and T' can be Si, Al, P, Ga, Fe, Co, Zn, B and a host of other elements. Materials with Si-O-Al bonding in the framework are called zeolites and are extensively used in many applications. Ion-exchange properties of these materials are exploited in the consumer and environmental industries. Chemical and petroleum industries use zeolites as catalysts in hydrocarbon transform ations. Synthesis of new microporous frameworks has led to the development of new technologies, and thus considerable effort worldwide is expended in their discovery. Microporous materials are typically made under hydrothermal conditions. Influence of nature of starting reactants, structure directing agents, pH, temperature, and aging all have profound influence on the synthesis process. This is primarily because the most interesting open frameworks are not necessarily the stable structures in the reaction medium. Thus, the discovery of new frameworks is often tied to finding the right composition and synthesis conditions that allow for kinetic stabilization of the structure. This complexity of the synthesis process and limited understanding of it has made it difficult to develop directed is of microporous materials and most advances in this field have been made by trial and error. The basic issues in crystal growth of these materials include: (1) Nature of the nucleation process; (2) Molecular structure and assembly of nuclei; (3) Growth of nuclei into crystals; (4) Morphology control; and (5) Transformation of frameworks into other structures. The NASA-funded research described in this paper focuses on all the above issues and has been described in several publications. We present the highlights of our program, especially with the focus on possible experiments in microgravity.
Author
Zeolites; Crystal Growth; Microporosity; Porous Materials; Synthesis (Chemistry)

20010020658 NASA Marshall Space Flight Center, Huntsville, AL USA

Characterizing the Use of Ultrasonic Energy in Promoting Uniform Microstructural Dispersions in Immiscible Mixtures

Grugel, R. N., NASA Marshall Space Flight Center, USA; Fedoseyev, A. I., Alabama Univ., USA; [2001]; 1p; In English; Aerospace Science, 10 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Gravity driven separation and preferential wetting precludes uniform microstructural distributions during solidification processing of immiscible, liquid-liquid mixtures. Historically, it is, however, established that liquid/liquid suspensions can be established and maintained by utilizing ultrasound. Following a brief introduction the results of experiments on immiscible mixtures subjected to ultrasonic energy during solidification processing will be compared and evaluated in view of a recently developed mathematical model. The presentation continues by discussion of scaling the model to commercial viability and concludes with the implications of such processing in a microgravity environment.

Author

Mathematical Models; Microstructure; Ultrasonics; Solubility; Liquid Phases; Solidification

20010020941 NASA Marshall Space Flight Center, Huntsville, AL USA

Commercial Space Research: Entering a New Stage

Nall, Mark E., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 39th; Aerospace Science, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-0180; No Copyright; Avail: Issuing Activity; Abstract Only

The Space Act which established NASA included direction that NASA is to foster to the maximum extent possible the commercial use of space. In order to achieve this, NASA began establishing in 1985, Commercial Space Centers (CSCs). These centers are a consortium of industry, academia, and government. Primarily university based, the CSCs are chartered to partner with industry to help companies learn how using space can improve their bottom line. Responsibility for the Commercial Space Centers rests with the Space Product Development Office at Marshall Space Flight Center. Since the program was established in 1985, SPD has sponsored nearly 180 commercial microgravity research payloads on 30 Shuttle missions. The vast majority of these missions were on the order of 6 days. Most companies have only had on average three flight opportunities to advance their product development efforts. From the product development standpoint of an individual company only three weeks of microgravity time have been obtained to date. of key importance to a company is the fact that this time has not been continuous. Anywhere from one to three years elapses between flights. Despite these flight constraints, the companies in the SPD program have made considerable progress. For example, over the course of the program through 1999, industry has invested over half a billion dollars in cash and in-kind. Over a dozen new product lines are in development by the industrial partners of the Commercial Space Centers. Now the companies partnered with the SPD program have a new opportunity in the International Space Station. The long duration capability provided by the Station will provide double the amount of per company average microgravity time in just the first increment. Current planning through planning increment 5 shows that commercial investment in space research should now be positioned for greater returns.

Author

Microgravity; Product Development; Space Commercialization; Space Processing; Technology Transfer

20010021223 NASA Marshall Space Flight Center, Huntsville, AL USA

Microgravity Disturbance Characterization of the Quench Module Insert (QMI) Phase Change Device (PCD)

Gattis, Christy, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 71st; Shock and Vibration, 6-10 Nov. 2000, Arlington, VA, USA

Contract(s)/Grant(s): RTOP 398-30-10; No Copyright; Avail: Issuing Activity; Abstract Only

The Materials Science Research Facility (MSRF) is a multi-user, multi-purpose facility for materials science research. One experiment within the MSRF will be the Quench Module Insert (QMI), a high-temperature furnace with unique capabilities for processing different classes of materials. The primary functions of the QMI furnace are to melt, directionally solidify, and quench metallic samples, providing data to aid in understanding the effects of the microgravity environment on the characteristics of these processed metals. The QMI houses sealed individual sample ampoules containing material to be processed. Quenching of the samples in the QMI furnace is accomplished by releasing low-melting-point metallic shoes into contact with the outside of the sample ampoule, dissipating heat and cooling the sample inside. The impact from this method of quench will induce sample vibrations which could be large enough to adversely affect sample quality. Utilizing breadboard hardware, the sample quench sequence, releasing the shoes, was conducted. Data was collected from accelerometers located on the breadboard sample cartridge, indicating the maximum acceleration achieved by the sample. The primary objective of the test described in this presentation was to deter-

mine the acceleration imparted on the sample by the shoe contact. From this information, the science community can better assess whether this method of quench will allow them to obtain the data they need.
Author
High Temperature; Furnaces; Quenching (Cooling); Phase Change Materials; Melting Points

20010021264 NASA Marshall Space Flight Center, Huntsville, AL USA
The Influence of Microgravity on Silica Sol-Gel Formation
Sibille, L., NASA Marshall Space Flight Center, USA; Smith, D. D., NASA Marshall Space Flight Center, USA; Cronise, R., NASA Marshall Space Flight Center, USA; Hunt, A. J., NASA Marshall Space Flight Center, USA; Wolfe, D. B., NASA Marshall Space Flight Center, USA; Snow, L. A., NASA Marshall Space Flight Center, USA; Oldenberg, S., NASA Marshall Space Flight Center, USA; Halas, N., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 6th; Aerogels, 9 Oct. 2000, Albuquerque, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We discuss space-flight experiments involving the growth of silica particles and gels. The effect of microgravity on the growth of silica particles via the sol-gel route is profound. In four different recipes spanning a large range of the parameter space that typically produces silica nanoparticles in unit-gravity, low-density gel structures were instead formed in microgravity. The particles that did form were generally smaller and more polydisperse than those grown on the ground. These observations suggest that microgravity reduces the particle growth rate, allowing unincorporated species to form aggregates and ultimately gel. Hence microgravity favors the formation of more rarefied structures, providing a bias towards diffusion-limited cluster-cluster aggregation. These results further suggest that in unit gravity, fluid flows and sedimentation can significantly perturb sol-gel substructures prior to gelation and these deleterious perturbations may be ”frozen” into the resulting microstructure. Hence, sol-gel pores may be expected to be smaller, more uniform, and less rough when formed in microgravity.
Author
Microgravity; Silica Gel; Sol-Gel Processes; Spaceborne Experiments

31
ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see categories 32 through 39.

20010020073 NASA Marshall Space Flight Center, Huntsville, AL USA
Improving System Engineering Excellence at NASA’s Marshall Space Flight Center
Takada, Pamela Wallace, NASA Marshall Space Flight Center, USA; Newton, Steve, NASA Marshall Space Flight Center, USA; Gholston, Sampson, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 52nd, 1-2 Oct. 2001, Toulouse, France; Sponsored by International Astronautical Congress, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

NASA’s Marshall Space Flight Center (MSFC) management feels that sound system engineering practices are essential for successful project management, NASA studies have concluded that recent project failures could be attributed in part to inadequate systems engineering. A recent survey of MSFC project managers and system engineers’ resulted in the recognition of a need for training in Systems Engineering Practices, particularly as they relate to MSFC projects. In response to this survey, an internal pilot short-course was developed to reinforce accepted practices for system engineering at MSFC. The desire of the MSFC management is to begin with in-house training and offer additional educational opportunities to reinforce sound system engineering principles to the more than 800 professionals who are involved with system engineering and project management. A Systems Engineering Development Plan (SEDP) has been developed to address the longer-term systems engineering development needs of MSFC. This paper describes the survey conducted and the training course that was developed in response to that survey.
Author
Engineering Management; Systems Engineering; Product Development; Flight Management Systems

20010020089 NASA Marshall Space Flight Center, Huntsville, AL USA
ASTP RBCC Activities
Nelson, Karl W., NASA Marshall Space Flight Center, USA; McArthur, Craig, NASA Marshall Space Flight Center, USA; Oct. 11, 2000; 16p; In English; SAE World Aviation, 10-12 Oct. 2000, San Diego, CA, USA
Contract(s)/Grant(s): RTOP 713-10-62; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This presentation reviews the activities of the Advanced Space Transportation Program (ASTP) in the development of Rocket-Based Combined Cycle (RBCC)technology. The document consist of the presentation slides for a talk scheduled to be given

to the World Aviation Congress and Exhibit of SAE. Included in the review is discussion of recent accomplishments in the area of Advanced Reusable technologies (ART), which includes work in flowpath testing, and system studies of the various vehicle/engine combinations including RBCC, Turbine Based Combined Cycle (TBCC) and Pulsed Detonation Engine (PDE). Pictures of the proposed RBCC Flowpaths are included. The next steps in the development process are reviewed.
CASI
Space Transportation; Single Stage Rocket Vehicles; Spacecraft Propulsion; Reusable Rocket Engines

20010020229 NASA Marshall Space Flight Center, Huntsville, AL USA
A Simplified Model of ARIS for Optimal Controller Design
Beech, Geoffrey S., NASA Marshall Space Flight Center, USA; Hampton, R. David, Alabama Univ., USA; [2001]; 10p; In English; 39th; Aerospace Sciences, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2001-1138; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Many space-science experiments require active vibration isolation. Boeing's Active Rack Isolation System (ARIS) isolates experiments at the rack (vs. experiment or sub-experiment) level, with multi e experiments per rack. An ARIS-isolated rack typically employs eight actuators and thirteen umbilicals; the umbilicals provide services such as power, data transmission, and cooling. Hampton, et al., used "Kane's method" to develop an analytical, nonlinear, rigid-body model of ARIS that includes full actuator dynamics (inertias). This model, less the umbilicals, was first implemented for simulation by Beech and Hampton; they developed and tested their model using two commercial-off-the-shelf (COTS) software packages. Rupert, et al., added umbilical-transmitted disturbances to this nonlinear model. Because the nonlinear model, even for the untethered system, is both exceedingly complex and "encapsulated" inside these COTS tools, it is largely inaccessible to ARIS controller designers. This paper shows that ISPR rattle-space constraints and small ARIS actuator masses permit considerable model simplification, without significant loss of fidelity. First, for various loading conditions, comparisons are made between the dynamic responses of the nonlinear model (untethered) and a truth model. Then comparisons are made among nonlinear, linearized, and linearized reduced-mass models. It is concluded that these three models all capture the significant system rigid-body dynamics, with the third being preferred due to its relative simplicity.
Author
Spaceborne Experiments; Vibration Isolators; Actuators; Rigid Structures

20010020448 Naval Research Lab., Washington, DC USA
Prototype Early Warning Fire Detection System: Test Series 2 Results, *25 Apr. - 5 May 2000*
Wright, Mark T., Hughes Associates, Inc., USA; Gottuk, Daniel T., Hughes Associates, Inc., USA; Wong, Jennifer T., Hughes Associates, Inc., USA; Pham, Hung, Hughes Associates, Inc., USA; Rose-Pehrsson, Susan L., Naval Research Lab., USA; Hart, Sean, Naval Research Lab., USA; Hammond, Mark, Naval Research Lab., USA; Williams, Frederick W., Naval Research Lab., USA; Tatem, Patricia A., Naval Research Lab., USA; Street, Thomas T., Naval Research Lab., USA; Oct. 23, 2000; 77p; In English
Report No.(s): AD-A383972; NRL/MR/6180-00-8506; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

The system under development combines a multi-criteria (sensor array) approach with sophisticated data analysis methods. Together an array of sensors and a multivariate classification algorithm has the potential to produce an early warning fire detection system with a low nuisance alarm rate. Several sensors measuring different parameters of the environment produce a pattern or response fingerprint for an event. Multivariate data analysis methods can be trained to recognize the pattern of an important event such as fire. Multivariate classification methods, such as neural networks, rely on the comparison of events (i.e., fires) with non-events (i.e., background and nuisance sources). Variations in the response of sensors can be used to train an algorithm to recognize events when they occur. The key to success of these methods is the appropriate design of sensor arrays and training sets of data used to develop the algorithm. This test series included a variety of conditions that may be encountered in a real shipboard environment. Every effort was made to consider many representative fire situations and potential interference sources, including the use of Navy approved materials.
Author
Early Warning Systems; Detection; Fires

20010020451 Army Engineer Waterways Experiment Station, Vicksburg, MS USA

Silent Inspector for Hydraulic Pipeline Dredges

Rosati, J., Army Engineer Waterways Experiment Station, USA; August 2000; 12p; In English

Report No.(s): AD-A383807; ERDC-TN-DOER-14; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This technical note (TN) describes the Silent Inspector (SI) for Hydraulic Pipeline Dredges (HPD) and documents field experiences of the work unit. The SI work unit of the Dredging Operations and Environmental Research (DOER) Program was established to develop standards, specifications, and software for a standardized, automated dredging contract monitoring system. The purpose of this TN is to document the ongoing development of the HPDSI (Hydraulic Pipeline Dredge Silent Inspector).

Author

Dredging; Operations Research; Standardization; Specifications

20010020490 Honeybee Robotics Ltd., New York, NY USA

The Athena Miniature Rock Coring and Rock Core Acquisition and Transfer System (Mini-Corer)

Myrick, T. M., Honeybee Robotics Ltd., USA; Gorevan, S. P., Honeybee Robotics Ltd., USA; Batting, C., Honeybee Robotics Ltd., USA; Stroescu, S., Honeybee Robotics Ltd., USA; Ji, J., Honeybee Robotics Ltd., USA; Maksymuk, M., Honeybee Robotics Ltd., USA; Davis, K. R., Honeybee Robotics Ltd., USA; Ummy, M. A., Honeybee Robotics Ltd., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 236-237; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The miniature rock coring and rock core acquisition and transfer system (Mini-Corer) is a part of the Athena Mars rover science payload. Its major objective is to acquire rock cores for in-situ examination by other instruments of the Athena instrument suite and to provide for a precision caching of the acquired cores for purposes of sample return. The Mini-Corer is a highly developed robotic drill capable of obtaining two 25-mm long and 8-mm diameter cores from the same hole from very strong rocks. The low power Mini-Corer can readily drill 25 mm into strong basalt in less than 6 minutes while consuming less than 10 watt-hours of power. A key feature of the Mini-Corer is its ability to break off the core from the base rock and retain the core. A pushrod internal to the core tube provides for a controlled and positive ejection of the core. This same pushrod is used to stabilize the target rock during the initial coring action. With the autonomous acquisition of a specialized tool, the Mini-Corer also acquires and transfers unconsolidated soil to the return cache. The Mini-Corer employs five brushed DC motors equipped with incremental encoders.

Author

Mars Surface; Core Sampling; Mars Missions; Planetary Cores; Spacecraft Instruments; Equipment Specifications

20010020626

Methods and conditions for reliability analysis of systems subject to common: cause failures

Vaurio, J.; Dec. 31, 1998; 26p; In English

Report No.(s): DE99-706799; LTKK-EN-A41; ISBN 951-764-218-0; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A general procedure is presented for incorporating common-cause failures in systems analysis with an implicit method, i.e. after first solving the system probability equation without common cause failures. Components of subsets are assumed to be equally vulnerable to common causes of any particular multiplicity. The method allows for age-dependent hazard rates, repairable and non-repairable components, systems with multiple common-cause groups, and systems where not all components are identical or subject to common cause failures. Key equations are given for both reliability block diagrams and fault trees (success and failure models), considering the system reliability, availability and failure intensity functions. Initial failures and certain human errors are included, mainly for standby system applications.

NTIS

Reliability Analysis; Systems Analysis; Human Factors Engineering; System Failures

20010020627

Exhaust emissions from petrol-fuelled passenger cars at low ambient temperatures

Laurikko, J.; Dec. 31, 1998; 250p; In English

Report No.(s): DE99-706798; VTT-PUB-348; ISBN 951-38-5234-2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The study at hand deals with regulated and unregulated exhaust emissions from petrol-fuelled cars at low ambient temperatures with present-day or near-future exhaust after treatment systems. The subject has been investigated at VTT over a decade and this report compiles data from various sub-studies carried out between the years 1993-1997. Each one of them viewed different

aspects of the phenomenon, like determining the low-temperature response of today's new cars employing three-way catalytic converters or assessing the long-term durability and the influence of vehicle mileage upon the low-temperature emissions performance. Within these studies, together more than 120 cars of model years from 1990 to 1997 have been tested. Most of them were normal, in- service vehicles with total mileages differing between only a few thousand kilometers for new cars up to 80,000 km or even more for the in-use vehicles. Both the US FTP75 and the European test cycle have been employed, and the ambient temperatures ranged from the baseline (+22 C) down to +/- 0 C, -7 C, and in some cases even to -20 C. The studies attested that new cars having today's advanced emissions control systems produced fairly low levels of emissions when tested in conditions designated in the regulations that are the basis of the current new-vehicle certification.
NTIS
Exhaust Emission; Exhaust Gases; Contaminants

20010020986
Design and construction of a device for elaborate films of Vyns or Cellulose with control thickness
Patlan, F.; Dec. 31, 1998; 98p; In Spanish; In English
Report No.(s): DE98-617532; INIS-MX-040; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This work is a part of the studies about the elaboration of reference radioactive sources, which are done in the National Institute of Nuclear Research in Mexico. Specially concerns with the elaboration of (alpha)-(beta) radioactive sources. The importance of this work is because their applications increase day by day. Medicine, engineering, agriculture and even the arts cannot escape to the influence and impact of the nuclear sciences. But, what are the radioactive sources, what is a holder of a radioactive source, why we elaborate holders with special materials, which is the best technique to elaborate them. These topics are commented in this work. The material is as follows: the introduction and objective are described in chapter one. The second chapter deals with concepts about atomic and molecular structures, general description of nuclear radiation and their characteristics, comments about radioactive law decay, interaction of the alpha particles with the matter and a short description about surface barrier detectors. The different methods for elaborate a radioactive source holders are described in the chapter three. This same chapter speaks the topic about the elaboration of vyns or cellulose films and a device is proposed for make them; are some methods described how to take measure of their thickness. Chapter four shows the results, analysis and the respective conclusions.
Author(NTIS)
Radiation Sources; Radioactive Materials; Radioactivity; Nuclear Radiation

20010021343 NASA Marshall Space Flight Center, Huntsville, AL USA
Requirements, Verification, and Compliance (RVC) Database Tool
Rainwater, Neil E., II, NASA Marshall Space Flight Center, USA; McDuffee, Patrick B., NASA Marshall Space Flight Center, USA; Thomas, L. Dale, NASA Marshall Space Flight Center, USA; [2001]; 2p; In English; 52nd; International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

This paper describes the development, design, and implementation of the Requirements, Verification, and Compliance (RVC) database used on the International Space Welding Experiment (ISWE) project managed at Marshall Space Flight Center. The RVC is a systems engineer's tool for automating and managing the following information: requirements; requirements traceability; verification requirements; verification planning; verification success criteria; and compliance status. This information normally contained within documents (e.g. specifications, plans) is contained in an electronic database that allows the project team members to access, query, and status the requirements, verification, and compliance information from their individual desktop computers. Using commercial-off-the-shelf (COTS) database software that contains networking capabilities, the RVC was developed not only with cost savings in mind but primarily for the purpose of providing a more efficient and effective automated method of maintaining and distributing the systems engineering information. In addition, the RVC approach provides the systems engineer the capability to develop and tailor various reports containing the requirements, verification, and compliance information that meets the needs of the project team members. The automated approach of the RVC for capturing and distributing the information improves the productivity of the systems engineer by allowing that person to concentrate more on the job of developing good requirements and verification programs and not on the effort of being a "document developer".
Derived from text
Requirements; Proving; Data Bases; Design Analysis; Spaceborne Experiments

20010021346 NASA Marshall Space Flight Center, Huntsville, AL USA

Analytical Models for Variable Density Multilayer Insulation Used in Cryogenic Storage

Hedayat, A., Sverdrup Technology, Inc., USA; Hastings, L. J., NASA Marshall Space Flight Center, USA; Brown, T., NASA Marshall Space Flight Center, USA; [2001]; 2p; In English; Cryogenic Engineering Conference and International Cryogenic Materials Conference, 16-20 Jul. 2001, Madison, WI, USA

Contract(s)/Grant(s): NAS8-40836; No Copyright; Avail: Issuing Activity; Abstract Only

A unique multilayer insulation concept for orbital cryogenic storage was experimentally evaluated at NASA Marshall Space Flight Center (MSFC) using the Multipurpose Hydrogen Test Bed (MHTB). A combination of foam/Multi layer Insulation (MLI) was used. The MLI (45 layers of Double Aluminized Mylar (DAM) with Dacron net spacers) was designed for an on-orbit storage period of 45 days and included several unique features such as: a variable layer density and larger but fewer DAM perforations for venting during ascent to orbit. The focus of this paper is on analytical modeling of the variable density MLI performance during orbital coast periods. The foam/MLI combination model is considered to have five segments. The first segment represents the foam layer. The second, third, and fourth segments represent the three layers of MLI with different layer densities and number of shields. Finally, the last segment is considered to be a shroud that surrounds the last MLI layer. The hot boundary temperature is allowed to vary from 164 K to 305 K. to simulate MLI performance, two approaches are considered. In the first approach, the variable density MLI is modeled layer by layer while in the second approach, a semi-empirical model is applied. Both models account for thermal radiation between shields, gas conduction, and solid conduction through the separator materials. The heat flux values predicted by each approach are compared for different boundary temperatures and MLI systems with 30, 45, 60, and 75 layers.

Author

Mathematical Models; Multilayer Insulation; Density (Mass/Volume); Foams; Cryogenic Fluid Storage

20010021680 NASA Ames Research Center, Moffett Field, CA USA

Modeling and Simulation for Propulsion Systems

Mehta, Unmeel B., NASA Ames Research Center, USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 197-223; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The Modeling and Simulation Subcommittee will promote, facilitate, guide, affect coordination, and focus on problems in modeling and simulation of propulsion systems leading to significantly reduced acquisition time, total life-cycle cost, and risk.

Author

Coordination; Propulsion System Configurations; Propulsion System Performance; Systems Simulation

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COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 Space Communications, Spacecraft Communications, Command and Tracking; for search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

20010019782 NASA Glenn Research Center, Cleveland, OH USA

Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000

Bauer, Robert, Editor, NASA Glenn Research Center, USA; Derwae, Robert, Editor, NASA Glenn Research Center, USA; December 2000; 370p; In English; 6th; Ka-band Utilizatoin, 31 May - 2 Jun. 2000, Cleveland, OH, USA; See also 20010019783 through 20010019799

Contract(s)/Grant(s): RTOP 315-90-2A

Report No.(s): NASA/CP-2000-210530; E-12507; NAS 1.55:210530; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The ACTS experiments program, which began in December 1993 and consisted of 103 different experiments, has made significant contributions to minimizing the risk of advanced satellite communications technology. The ACTS Conference 2000 (AC2000) was held to report the results of the program since the last ACTS conference was held in 1995 and to celebrate the end of a very successful satellite program. The conference was held on May 31, 2000, as part of the 6th Ka-band Utilization Conference in Cleveland, Ohio. Approximately 280 representatives of industry, academia, and government attended. The conference was organized into two parts: a technical session during the day and an evening reception. During the day, a series of five technical

sessions included presentations of 17 papers covering the results of the experiment activity and technical performance of the satellite. In the evening, a reception was held to celebrate the end of the ACTS Experiments Program on one of NASA's most successful experimental communications satellite. These proceedings were developed to capture the entire event, including the evening reception.
Author
Communication Satellites; Extremely High Frequencies; Telecommunication

20010019783 NASA Glenn Research Center, Cleveland, OH USA
The Advanced Communications Technology Satellite - Performance, Reliability and Lessons Learned
Krawczyk, Richard J., NASA Glenn Research Center, USA; Ignaczak, Louis R., NASA Glenn Research Center, USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 3-8 and 181-190; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Advanced Communications Satellite (ACTS) was conceived and developed in the mid- 1980s as an experimental satellite to demonstrate unproven Ka-band technology, and potential new commercial applications and services. Since launch into geostationary orbit in September 1993. ACTS has accumulated almost seven years of essentially trouble-free operation and met all program objectives. The unique technology, service experiments. and system level demonstrations accomplished by ACTS have been reported in many forums over the past several years. As ACTS completes its final experiments activity, this paper will relate the top-level program goals that have been achieved in the design, operation, and performance of the particular satellite subsystems. Pre-launch decisions to ensure satellite reliability and the subsequent operational experiences contribute to lessons learned that may be applicable to other comsat programs.
Author
Reliability; ACTS; Performance Prediction; Reliability Analysis

20010019784 NASA Glenn Research Center, Cleveland, OH USA
ACTS Ka-Band Earth Stations: Technology, Performance, and Lessons Learned
Reinhart, Richard C., NASA Glenn Research Center, USA; Struharik, Steven J., Communications Satellite Corp., USA; Diamond, John J., Analex Corp., USA; Stewart, David, GTE Technology Organization, USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 9-22 and 191-201; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Advanced Communications Technology Satellite (ACTS) Project invested heavily in prototype Ka-band satellite ground terminals to conduct an experiments program with the ACTS satellite. The ACTS experiment's program proposed to validate Ka-band satellite and ground station technology. demonstrate future telecommunication services. demonstrate commercial viability and market acceptability of these new services, evaluate system networking and processing technology, and characterize Ka-band propagation effects, including development of techniques to mitigate signal fading. This paper will present a summary of the fixed ground terminals developed by the NASA Glenn Research Center and its industry partners, emphasizing the technology and performance of the terminals (Part 1) and the lessons learned throughout their six year operation including the inclined orbit phase of operations (Full Report). An overview of the Ka-band technology and components developed for the ACTS ground stations is presented. Next. the performance of the ground station technology and its evolution during the ACTS campaign are discussed to illustrate the technical tradeoffs made during the program and highlight technical advances by industry to support the ACTS experiments program and terminal operations. Finally. lessons learned during development and operation of the user terminals are discussed for consideration of commercial adoption into future Ka-band systems. The fixed ground stations used for experiments by government, academic, and commercial entities used reflector based offset-fed antenna systems ranging in size from 0.35m to 3.4m antenna diameter. Gateway earth stations included two systems, referred to as the NASA Ground Station (NGS) and the Link Evaluation Terminal (LET). The NGS provides tracking, telemetry, and control (TT&C) and Time Division Multiple Access (TDMA) network control functions. The LET supports technology verification and high data rate experiments. The ground stations successfully demonstrated many services and applications at Ka-band in three different modes of operation: circuit switched TDMA using the satellite on-board processor, satellite switched SS-TDMA applications using the on-board Microwave Switch Matrix (MSM), and conventional transponder (bent-pipe) operation. Data rates ranged from 4.8 kbps up to 622 Mbps. Experiments included: 1) low rate (4.8- 1 00's kbps) remote data acquisition and control using small earth stations, 2) moderate rate (1-45 Mbps) experiments included full duplex voice and video conferencing and both full duplex and asymmetric data rate protocol and network evaluation using mid-size ground stations, and 3) link characterization experiments and high data rate

(155-622 Mbps) terrestrial and satellite interoperability application experiments conducted by a consortium of experimenters using the large transportable ground stations.
Author
Acceptability; Antenna Design; Data Acquisition; Network Control; Telecommunication; Video Communication

20010019785 NASA Glenn Research Center, Cleveland, OH USA
T1 VSAT Fade Compensation Statistical Results
Johnson, Sandra K., NASA Glenn Research Center, USA; Acosta, Roberto, NASA Glenn Research Center, USA; Ugweje, Oke, Akron Univ., USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 23-33 and 203-209; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

New satellite communication systems are steadily seeking to use higher frequency bands to accommodate the requirements for additional capacity. At these higher frequencies, propagation impairments that did not significantly affect the signal at lower frequencies begin to have considerable impact. In Ka-band. the next logical commercial frequency band to be used for satellite communication, attenuation of the signal due to rain is a primary concern. An experimental satellite built by NASA, the Advanced Communication Technology Satellite (ACTS). launched in September 1993, is the first U.S. communication satellite operating in the Ka-band. In addition to higher carrier frequencies, a number of other new technologies, including on-board baseband processing. multiple beam antennas, and rain fade detection and compensation techniques, were designed into the ACTS. Verification experiments have been conducted since the launch to characterize the new technologies. The focus of this paper is to characterize the method used by the ACTS TI Very Small Aperture Terminal (TI VSAT) ground stations in detecting the presence of fade in the communication signal and to adaptively compensate for it by the addition of burst rate reduction and forward error correction. Measured data obtained from the ACTS program was used to validate the compensation technique. A software process was developed and demonstrated to statistically characterize the increased availability achieved by the compensation techniques in terms of the bit error rate time enhancement factor. Several improvements to the ACTS technique are discussed and possible implementations for future Ka band system are offered.
Author
ACTS; Error Analysis; Multibeam Antennas; Onboard Data Processing

20010019786 ITT Industries, Inc., Advanced Engineering and Sciences, Ashburn, VA USA
Summary of Advanced Communications Technology Satellite Propagation Experiments
Ippolito, Louis J., ITT Industries, Inc., USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 35-51 and 211-214; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The development of link performance specifications for Ka-band systems is dependent on a reliable source of propagation effects data and on validated prediction methods for the propagation environment. The NASA ACTS (Advanced Communications Technology Satellite) provided long term, continuous Ka-band propagation measurements for over five years to locations in North America. The design and performance of broadband Ka-band satellite communications systems is heavily dependent on the propagation characteristics of the earth-space path. Both GSO (geosynchronous orbit) and NGSO (non-geosynchronous orbit) systems have been proposed and filed with the ITU-R. internationally. and with the Federal Communications Commission, FCC, in the USA. These systems are being designed with broadband communications capabilities to provide a wide array of fixed (FSS). broadcast (BSS), and mobile (MSS) satellite services. A common characteristic of the Ka-band systems is that the service links operate with small user terminals with inherent low link margins. This makes the impact of atmospheric effects even more critical in the design of these systems. The performance of low margin broadband systems will be affected by atmospheric impairments in a different manner than for C-band or Ku-band high margin systems. Rain attenuation is still critical. however other effects such as gaseous attenuation. cloud attenuation, tropospheric scintillation and wet surface effects can increase in significance. Depolarization and phase distortion effects are also important for frequency reuse systems. and for systems employing high order modulation techniques. Broadband systems must account I'm dispersion effects caused by the atmosphere. including amplitude and phase dispersion from rain and tropospheric scintillation.
Author
ACTS; Performance Prediction; Functional Design Specifications; Geosynchronous Orbits; Prediction Analysis Techniques

20010019787 Alaska Univ., Electrical Engineering Dept., Fairbanks, AK USA

Rain Attenuation Model Comparison and Validation

Mayer, Charles E., Alaska Univ., USA; Jaeger, Bradley E., Alaska Univ., USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 53-68 and 215-221; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Advanced Communications Technology Satellite (ACTS) propagation experiment has yielded five years measurements of rain rates and attenuation at 20.185 GHz and 27.505 GHz in seven diverse climate regions throughout North America. Figure I shows the former locations of ACTS propagation terminals. In the pursuit of rain attenuation models. rain has generally been classified as stratiform, convective. or cyclonic. Location has everything to do with how much of each of these types of rain a communications link will experience. In addition. changes in drop size distribution. drop shape, and canting angle are to be expected. Perturbations in average rain characteristics are common with El Nino. This paper discusses the ACTS propagation measurements in contrast to the Revised Two Component model and the DAH model.

Author

Rain; Size Distribution; Data Links; Convection; ACTS

20010019788 ITT Industries, Inc., Advanced Engineering and Sciences, Ashburn, VA USA

Propagation Effects Handbook for Satellite Systems Design

Ippolito, Louis J., ITT Industries, Inc., USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 69-83 and 223-231; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper describes the latest edition of the NASA Propagation Effects Handbook for Satellite Systems Design and presents a summary of application of the handbook information to satellite link design and performance. NASA, which has supported a large part of the experimental work in radiowave propagation on space communications links, recognized the need for a reference handbook of this type, and initiated a program in the late 1970's to develop and update a document that will meet this need. The Fifth Edition provides, in a single document, an update to two previous NASA handbooks; the fourth edition of a handbook which focused on propagation effects from 10 to 100 GHz, and the second edition of a companion handbook which covered propagation effects on satellite systems at frequencies below 10 GHz. This Fifth Edition covers the full range of radiowave frequencies that are in use or allocated for space communications and services, from nominally 100 MHz up to 100 GHz.

Author

Communication Networks; Handbooks; Satellite Design

20010019789 NASA Glenn Research Center, Cleveland, OH USA

Special Effects: Antenna Wetting, Short Distance Diversity and Depolarization

Acosta, Roberto J., NASA Glenn Research Center, USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 85-96 and 233-240; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Advanced Communication Technology Satellite (ACTS) communications system operates in the Ka frequency band. ACTS uses multiple, hopping, narrow beams and very small aperture terminal (VSAT) technology to establish a system availability of 99.5% for bit-error-rates of 5 x 10(exp -7) Or better over the continental USA. In order maintain this minimum system availability in all US rain zones, ACTS uses an adaptive rain fade compensation protocol to reduce the impact of signal attenuation resulting from propagation effects. The purpose of this paper is to present the results of system and sub-system characterizations considering the statistical effects of system variances due to antenna wetting and depolarization effects. In addition the availability enhancements using short distance diversity in a sub-tropical rain zone are investigated.

Author

ACTS; Augmentation; Bit Error Rate; Extremely High Frequencies; Rain; Wetting

20010019790 NASA Glenn Research Center, Cleveland, OH USA

Survey of Advanced Applications Over ACTS

Bauer, Robert, NASA Glenn Research Center, USA; McMasters, Paul, Analex Corp., USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 97-101 and 241-249; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Advanced Communications Technology Satellite (ACTS) system provided a national testbed that enabled advanced applications to be tested and demonstrated over a live satellite link. of the applications that used ACTS. some offered unique advantages over current methods, while others simply could not be accommodated by conventional systems. The initial technical

and experiments results of the program were reported at the 1995 ACTS Results Conference. in Cleveland, Ohio. Since then, the Experiments Program has involved 45 new experiments comprising 30 application experiments and 15 technology related experiments that took advantage of the advanced technologies and unique capabilities offered by ACTS. The experiments are categorized and quantified to show the organizational mix of the experiments program and relative usage of the satellite. Since paper length guidelines preclude each experiment from being individually reported, the application experiments and significant demonstrations are surveyed to show the breadth of the activities that have been supported. Experiments in a similar application category are collectively discussed, such as. telemedicine. or networking and protocol evaluation. Where available. experiment conclusions and impact are presented and references of results and experiment information are provided. The quantity and diversity of the experiments program demonstrated a variety of service areas for the next generation of commercially available, advanced satellite communications.
Author
ACTS; Surveys; Telemedicine

20010019791 Mayo Clinic, Rochester, MN USA
NASA/DARPA ACTS Project for Evaluation of Telemedicine Outreach Using Next-Generation Communications Satellite Technology: Mayo Clinic Participation
Khandheria, Bijoy K., Mayo Clinic, USA; Gilbert, Barry, Mayo Clinic, USA; Mitchell, Marvin P., Mayo Clinic, USA; Bengali, Abdul, Mayo Clinic, USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 103-108 and 251; In English; See also 20010019782; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

To describe the development of telemedicine capabilities - application of remote consultation and diagnostic techniques - and to evaluate the feasibility and practicality of such clinical outreach to rural and underserved communities with limited telecommunications infrastructures.
Author
Telemedicine; Feasibility Analysis; Procedures

20010019792 NASA Glenn Research Center, Cleveland, OH USA
ACTS Satellite Telemammography Network Experiments
Kachmar, Brian A., Analex Corp., USA; Kerczewski, Robert J., NASA Glenn Research Center, USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 109-115 and 253-260; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Satellite Networks and Architectures Branch of NASA's Glenn Research Center has developed and demonstrated several advanced satellite communications technologies through the Advanced Communications Technology Satellite (ACTS) program. One of these technologies is the implementation of a Satellite Telemammography Network (STN) encompassing NASA Glenn, the Cleveland Clinic Foundation. the University of Virginia, and the Ashtabula County Medical Center. This paper will present a look at the STN from its beginnings to the impact it may have on future telemedicine applications. Results obtained using the experimental ACTS satellite demonstrate the feasibility of Satellite Telemammography. These results have improved teleradiology processes and mammography image manipulation, and enabled advances in remote screening methodologies. Future implementation of satellite telemammography using next generation commercial satellite networks will be explored. In addition, the technical aspects of the project will be discussed, in particular how the project has evolved from using NASA developed hardware and software to commercial off the shelf (COTS) products. Development of asymmetrical link technologies was an outcome of this work. Improvements in the display of digital mammographic images, better understanding of end-to-end system requirements, and advances in radiological image compression were achieved as a result of the research. Finally, rigorous clinical medical studies are required for new technologies such as digital satellite telemammography to gain acceptance in the medical establishment. These experiments produced data that were useful in two key medical studies that addressed the diagnostic accuracy of compressed satellite transmitted digital mammography images. The results of these studies will also be discussed.
Author
Telecommunication; Telemedicine; Radiology; Computer Programs; ACTS

20010019793 Passport to Knowledge, Morristown, NJ USA
Satellites and the Internet as a "Passport to Knowledge" A New Model of Teaching and Learning
Haines-Stiles, Geoffrey, Passport to Knowledge, USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 117-120 and 261-269; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

While business and government research agencies have begun to take full advantage of the Information Age. many secondary schools (at least in the United States) continue to operate on a ”19th century model” of teaching and learning Science education often relies on textbooks and ”lab.” (hands-on) projects that are implemented without real world context. From 1995-1998 PASSPORT TO KNOWLEDGE (P2K) worked with NASA’s ACTS satellite project on 3 interactive learning adventures and effectively demonstrated that a new model of science education is practical and effective. Project evaluation by a nationally-recognized education research group provided convincing evidence of increased mastery by students of factual content, improved attitudes towards science and high technology, and useful practice in the research skills needed in the world of 21st century work beyond school. Examples of video and other content, together with a review of statistically-meaningful results, are provided from all 3 P2K Modules that used ACTS: LIVE FROM THE STRATOSPHERE (1995), LIVE FROM ANTARCTICA 2 (1997) and LIVE FROM THE RAINFOREST (1998.) Each project relied on a technical ”first” only possible at that time through the use of ACTS. These included the first live video from a plane in flight at 4 1,000 feet (NASA’s Kuiper Airborne Observatory carrying an infrared telescope): the first-ever video interaction from America’s Palmer Station off the Antarctic Peninsula. and the first interactive video broadcast from the heart of the Amazon rainforest. The results. however, were much more than purely technical achievements: P2K, utilizing the full duplex communications possibilities enabled by ACTS, was able to structure educationally meaningful interactions and experiences involving not just satellite television, but also Internet based opportunities. ACTS also provided invaluable project coordination between home base and the remote sites. P2K has continued with LIVE FROM THE SUN and LIVE FROM THE STORM, incorporating the lessons of the earlier projects, while utilizing new technologies such as streaming video as they emerge.

Author

Broadcasting; Coordination; Education; Infrared Radiation; Research and Development; Satellite Television; Schools; Technologies

20010019794 Space and Naval Warfare Systems Center, San Diego, CA USA

Advanced Shipboard Communications Demonstrations with ACTS

Axford, Roy A., Space and Naval Warfare Systems Center, USA; Jedrey, Thomas C., Jet Propulsion Lab., California Inst. of Tech., USA; Rupar, Michael A., Naval Research Lab., USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 121-133 and 271-278; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

For ships at sea. satellites provide the only option for high data rate (HDR), long haul communications. Furthermore the demand for HDR satellite communications (SATCOM) for military and commercial ships. and other offshore platforms is increasing. Presently the bulk of this maritime HDR SATCOM connectivity is provided via C-band and X-band. However, the shipboard antenna sizes required to achieve a data rate of, say T 1 (1.544 Mbps) with present C-/X-band SATCOM systems range from seven to ten feet in diameter. This limits the classes of ships to which HDR services can be provided to those which are large enough to accommodate the massive antennas. With its high powered K/Ka-band spot beams, the National Aeronautics and Space Administration’s (NASA) Advanced Communications Technology Satellite (ACTS) was able to provide T I and higher rate services to ships at sea using much smaller shipboard antennas. This paper discusses three shipboard HDR SATCOM demonstrations that were conducted with ACTS between 1996 and 1998. The first demonstration involved a 2 Mbps link provided to the seismic survey ship MN Geco Diamond equipped with a 16-inch wide, 4.5-inch tall, mechanically steered slotted waveguide array antenna developed by the Jet Propulsion Laboratory. In this February 1996 demonstration ACTS allowed supercomputers ashore to process Geco Diamond’s voluminous oceanographic seismic data in near real time. This capability allowed the ship to adjust its search parameters on a daily basis based on feedback from the processed data, thereby greatly increasing survey efficiency. The second demonstration was conducted on the US Navy cruiser USS Princeton (CG 59) with the same antenna used on Geco Diamond. Princeton conducted a six-month (January-July 1997) Western Hemisphere solo deployment during which time T1 connectivity via ACTS provided the ship with a range of valuable tools for operational, administrative and quality-of-life tasks. In one instance, video teleconferencing (VTC) via ACTS allowed the ship to provide life-saving emergency medical aid, assisted by specialists ashore. to a fellow mariner - the Master of a Greek cargo ship. The third demonstration set what is believed to be the all-time SATCOM data rate record to a ship at sea, 45 Mbps in October 1998. This Lake Michigan (Chicago area) demonstration employed one of ACTS’ fixed beams and involved the smallest of the three vessels, the 45-foot Bayliner M/V Entropy equipped with a modified commercial-off-the-shelf one-meter antenna. A variety of multi-media services were provided to Entropy through a stressing range of sea states. These three demonstrations provided a preview of the capabilities that could be provided to future mariners on a more routine basis when K/Ka-band SATCOM systems are widely deployed.

Author

ACTS; Cargo Ships; Deployment; Extremely High Frequencies; Oceanographic Parameters; Real Time Operation; Satellite Communication

20010019795 NASA Glenn Research Center, Cleveland, OH USA

A History of the Improvement of Internet Protocols Over Satellites Using ACTS

Allman, Mark, NASA Glenn Research Center, USA; Kruse, Hans, Ohio Univ., USA; Ostermann, Shawn, Ohio Univ., USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 135-143 and 279-290; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper outlines the main results of a number of ACTS experiments on the efficacy of using standard Internet protocols over long-delay satellite channels. These experiments have been jointly conducted by NASAs Glenn Research Center and Ohio University over the last six years. The focus of our investigations has been the impact of long-delay networks with non-zero bit-error rates on the performance of the suite of Internet protocols. In particular, we have focused on the most widely used transport protocol, the Transmission Control Protocol (TCP), as well as several application layer protocols. This paper presents our main results, as well as references to more verbose discussions of our experiments.

Author

ACTS; Internets; Protocol (Computers)

20010019796 Carnegie-Mellon Univ., Computer Science Dept., Pittsburgh, PA USA

Mobile Internet Protocol Performance and Enhancements Over ACTS

Johnson, David B., Carnegie-Mellon Univ., USA; Bennington, Bernard J., Carnegie-Mellon Univ., USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 145-150 and 291-299; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In 1997, Caterpillar and Carnegie Mellon University started a three-year research program to develop a global mobile wireless communication system. one that will support all corporate, operations, dealerships. and end customers' mobile communications reliably. The system is expected to consolidate needs for all Caterpillar business units. from large mining equipment to small construction equipment, from agricultural systems to field support systems. Because of the remote location of many of Caterpillar's customers, for example large mines or quarries, the approach was to assume no common availability of public networks. Caterpillar also wanted the end architecture to be capable of incorporating many competitive IT and radio manufacturer's products, and to have open interfaces for easy usage. The mining and construction equipment industry, like many other industries. is seeking to differentiate their hard products from those of their competition by adding value with services and applications. The wireless communication system was seen as part of this strategy. The system will support many of these initiatives. for example. it is necessary to implement improved service for machines in the field, by providing remote access to machines and people From anywhere to anywhere. Other immediate uses include, providing direct access for field service technicians to an up-to-date database of service information, hence reducing the problems of using current CD-ROM technology for frequently changing service information. It is also expected to allow dealers and technicians to do remote diagnosis of a machine's condition using existing and future onboard sensors and data reduction systems. Finally, Caterpillar wants to be able to field intelligent real-time applications such as information support for earth-moving operations, incorporating real time access to and updating of topographical maps, and also wants to be able to field intelligent cooperating robotic machines.

Derived from text

Data Bases; Data Reduction; Diagnosis; Internets; Protocol (Computers); Performance Prediction; Wireless Communication; Voice Communication

20010019797 NASA Glenn Research Center, Cleveland, OH USA

NASA and Industry Benefits of ACTS High Speed Network Interoperability Experiments

Zernic, M. J., NASA Glenn Research Center, USA; Beering, D. R., Infinite Global Infrastructures, LLC, USA; Brooks, D. E., Infinite Global Infrastructures, LLC, USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 151-157 and 301-310; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper provides synopses of the design. implementation, and results of key high data rate communications experiments utilizing the technologies of NASA's Advanced Communications Technology Satellite (ACTS). Specifically, the network protocol and interoperability performance aspects will be highlighted. The objectives of these key experiments will be discussed in their relevant context to NASA missions, as well as, to the comprehensive communications industry. Discussion of the experiment implementation will highlight the technical aspects of hybrid network connectivity, a variety of high-speed interoperability architectures, a variety of network node platforms, protocol layers, internet-based applications, and new work focused on distinguishing between link errors and congestion. In addition, this paper describes the impact of leveraging government-industry partnerships to achieve technical progress and forge synergistic relationships. These relationships will be the key to success as

NASA seeks to combine commercially available technology with its own internal technology developments to realize more robust and cost effective communications for space operations.
Author
ACTS; Errors; High Speed; Protocol (Computers); Network Analysis; Internets

20010019798 NASA Glenn Research Center, Cleveland, OH USA
Global Interoperability of High Definition Video Streams Via ACTS and Intelsat
Hsu, Eddie, Jet Propulsion Lab., California Inst. of Tech., USA; Wang, Charles, Jet Propulsion Lab., California Inst. of Tech., USA; Bergman, Larry, Jet Propulsion Lab., California Inst. of Tech., USA; Pearman, James, Sony Pictures High Definition Center, USA; Bhasin, Kul, NASA Glenn Research Center, USA; Clark, Gilbert, Maryland Univ., USA; Shopbell, Patrick, Maryland Univ., USA; Gill, Mike, National Library of Medicine, USA; Tatsumi, Haruyuki, Sapporo Medical Univ., Japan; Kadowaki, Naoto, Communications Research Lab., Japan; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 159-170 and 311-319; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In 1993, a proposal at the Japan.-U.S. Cooperation in Space Program Workshop lead to a subsequent series of satellite communications experiments and demonstrations, under the title of Trans-Pacific High Data Rate Satellite Communications Experiments. The first of which is a joint collaboration between government and industry teams in the USA and Japan that successfully demonstrated distributed high definition video (HDV) post-production on a global scale using a combination of high data rate satellites and terrestrial fiber optic asynchronous transfer mode (ATM) networks. The HDV experiment is the first GIBN experiment to establish a dual-hop broadband satellite link for the transmission of digital HDV over ATM. This paper describes the team's effort in using the NASA Advanced Communications Technology Satellite (ACTS) at rates up to OC-3 (155 Mbps) between Los Angeles and Honolulu, and using Intelsat at rates up to DS-3 (45 Mbps) between Kapolei and Tokyo, with which HDV source material was transmitted between Sony Pictures High Definition Center (SPHDC) in Los Angeles and Sony Visual Communication Center (VCC) in Shinagawa, Tokyo. The global-scale connection also used terrestrial networks in Japan, the States of Hawaii and California. The 1.2 Gbps digital HDV stream was compressed down to 22.5 Mbps using a proprietary Mitsubishi MPEG-2 codec that was ATM AAL-5 compatible. The codec: employed four-way parallel processing. Improved versions of the codec are now commercially available. The successful post-production activity performed in Tokyo with a HDV clip transmitted from Los Angeles was predicated on the seamless interoperation of all the equipment between the sites, and was an exciting example in deploying a global-scale information infrastructure involving a combination of broadband satellites and terrestrial fiber optic networks. Correlation of atmospheric effects with cell loss, codec drop-out, and picture quality were made. Current efforts in the Trans-Pacific series plan to examine the use of Internet Protocol (IP)-related technologies over such an infrastructure. The use of IP allows the general public to be an integral part of the exciting activities, helps to examine issues in constructing the solar-system internet, and affords an opportunity to tap the research results from the (reliable) multicast and distributed systems communities. The current Trans- Pacific projects, including remote astronomy and digital library (visible human) are briefly described.
Author
ACTS; Asynchronous Transfer Mode; Atmospheric Effects; Internets; International Cooperation

20010019799 NASA Glenn Research Center, Cleveland, OH USA
Partnering to Change the Way NASA and the Nation Communicate Through Space
Vrotsos, Pete A., NASA Glenn Research Center, USA; Budinger, James M., NASA Glenn Research Center, USA; Bhasin, Kul, NASA Glenn Research Center, USA; Ponchak, Denise S., NASA Glenn Research Center, USA; Proceeding of the Advanced Communications Technology Satellite (ACTS) Conference 2000; December 2000, pp. 171-178 and 321-326; In English; See also 20010019782; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

For at least 20 years, the Space Communications Program at NASA Glenn Research Center (GRC) has focused on enhancing the capability and competitiveness of the U.S. commercial communications satellite industry. GRC has partnered with the industry on the development of enabling technologies to help maintain U.S. preeminence in the worldwide communications satellite marketplace. The Advanced Communications Technology Satellite (ACTS) has been the most significant space communications technology endeavor ever performed at GRC, and the centerpiece of GRC's communication technology program for the last decade. Under new sponsorship from NASA's Human Exploration and Development of Space Enterprise, GRC has transitioned the focus and direction of its program, from commercial relevance to NASA mission relevance. Instead of one major experimental spacecraft and one headquarters sponsor, GRC is now exploring opportunities for all of NASA's Enterprises to benefit from advances in space communications technologies, and accomplish their missions through the use of existing and emerging commercially provided services. A growing vision within NASA is to leverage the best commercial standards, technologies, and ser-

vices as a starting point to satisfy NASA's unique needs. GRC's heritage of industry partnerships is closely aligned with this vision. NASA intends to leverage the explosive growth of the telecommunications industry through its impressive technology advancements and potential new commercial satellite systems. GRC's partnerships with the industry, academia, and other government agencies will directly support all four NASA's future mission needs, while advancing the state of the art of commercial practice. GRC now conducts applied research and develops and demonstrates advanced communications and network technologies in support of all four NASA Enterprises (Human Exploration and Development of Space, Space Science, Earth Science, and Aero-Space Technologies).
Author
ACTS; Earth Sciences; Research and Development; Technologies

20010019867 Defence Science and Technology Organisation, Surveillance Systems Div., Salisbury, Australia
The Influence of Communication Bandwidth on Target Tracking with Angle Only Measurements from Two Platforms
Ristic, Branko, Defence Science and Technology Organisation, Australia; Aruiampalam, Sanjeev, Defence Science and Technology Organisation, Australia; October 2000; 15p; In English; Sponsored in part by DACD
Report No.(s): AD-A385664; DSTO-TR-1053; DODA-AR-011-595; Copyright; Avail: Defense Technical Information Center (DTIC)

A multi-platform angle-only tracking system combines the angular measurements from distributed networked sensors in order to estimate the full kinematic target state. This report investigates the effect of communication bandwidth on track quality in a system which receives angle-only measurements from two networked sensors installed on two airborne moving platforms. The investigation is based on the Cramer-Rao lower bound of the mean-square range error for the case considered. The bound is derived for recursive estimators with prior information and compared with two algorithms: (1) maximum likelihood estimation over a cumulative measurement set, and (2) extended Kalman filter with triangulated range estimates.
DTIC
Tracking (Position); Target Acquisition; Algorithms; Maximum Likelihood Estimates; Bandwidth; Angles (Geometry)

20010019893 Norwegian Defence Research Establishment, Kjeller, Norway
Specification of an ESM-Demonstrator ***Spesifikasjon av ESM-Demonstrator***
Malnes, Eirik, Norwegian Defence Research Establishment, Norway; Eilenvstjonn, Joar, Norwegian Defence Research Establishment, Norway; Kulbotten, Gunnar, Norwegian Defence Research Establishment, Norway; Kvernsveen, Kirsten, Norwegian Defence Research Establishment, Norway; Ohra, Hans, Norwegian Defence Research Establishment, Norway; Dec. 15, 2000; 48p; In Norwegian; Original contains color illustrations
Contract(s)/Grant(s): FFIE Proj. 805/113
Report No.(s): FFI/RAPPORT-2000/06388; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The report contains a specification of an Electronic Support Measure (ESM) device for demonstration purposes. The device will be used by FFI to demonstrate modern passive positioning and identification techniques for the Norwegian Air Force. The demonstrator contains three modules. The main module consists of antennas, tuners and sampling devices which extracts digital information from the RF-environment. Pulses from radars and other emitters in the bandwidth of the tuner will be digitized. A pulse sorting device will cluster pulses from the same pulse train into an emission description word (EDW). The output of the first module is hence a continuous flow of EDWs. A second module is a PC which uses the EDWs to generate a picture of the emitter activity. It uses bearing information and identification techniques to separate the different emitters. by correlating the crystal oscillator frequency with an emitter library it will be possible to get unique identification of the emitter. The third device takes pulse samples from the tuner and tries to identify the emitters by its pulse shape (fingerprint). Both modules will be used to demonstrate and evaluate modern signal processing techniques which can give a Specific Emitter Identification (SEI), i.e to separate different emitters of the same fabric (type).
Author
Emitters; Identifying; Distribution (Property)

20010019894 Norwegian Defence Research Establishment, Kjeller, Norway
Correlation and Doppler Properties of a Class of Balanced Binary Radar Codes ***Korrelasjons- og Doppleregenskapene til en Klasse Lineaere Fasekodede Signaler***
Larsen, Svein Sigurd, Norwegian Defence Research Establishment, Norway; Dec. 19, 2000; 56p; In Norwegian; Original contains color illustrations
Contract(s)/Grant(s): FFIE Proj. 726/170
Report No.(s): FFI/RAPPORT-2000/06134; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report gives the correlation and doppler properties of 10 balanced binary radar codes. by autocorrelation simulations the sidelobe levels of the codes are presented while cross correlation simulations give the orthogonality of the codes. The last part of the report presents the correlation loss on the codes due to doppler shift on the code and on the carrier.
Author
Cross Correlation; Simulation; Autocorrelation; Doppler Effect

20010020303 Defence Research Establishment Ottawa, Ottawa, Ontario Canada
Limitations and Strengths of the Fourier Transform Method to Detect Accelerating Targets
Thayaparan, Thayananthan; Yasotharan, Ambighairajah; Nov. 2000; 36p; In English
Report No.(s): AD-A385574; DREO-TM-2000-078; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There are limitations and shortcomings to the Fourier transform method to detect accelerating targets because of the phenomenon known as Doppler smearing. In using a Pulse Doppler Radar to detect a non-accelerating target in additive white Gaussian noise and to estimate its radial velocity, the Fourier method provides an output signal-to-noise ratio (SNR) that increases linearly with the number of pulses. When the target is accelerating, the Fourier method may still be used to detect the target and estimate its median velocity, provided the acceleration is small enough in the sense described in the paper. For a given acceleration, when the number of pulses is increased, the output SNR of the Fourier method varies as a concave function, increasing to a maximum and then decreasing, before the method fails catastrophically. Thus the number of pulses and the acceleration have to be matched to achieve optimum performance. Empirical formulae for the dependence of the optimum SNR and the optimum number of pulses on the acceleration are given. The results are shown to be relevant to the design of Generalized Likelihood Ratio Test (GLRT) based detectors that apply a search over a grid.
DTIC
Fourier Transformation; Radar Targets; Target Acquisition; Pulse Doppler Radar; Likelihood Ratio; Optimization; Signal Processing; Fourier Analysis

20010020307 Army Research Lab., Sensors Directorate, Adelphi, MD USA
An Analytic Description of a Harmonic Decomposition Technique for Correcting Signal Errors Due to Wideband Radar Phase Detector ***Final Report, Apr.-Jun. 2000***
Pizzillo, Thomas J.; Silvious, Jerry; Nov. 2000; 19p; In English
Report No.(s): AD-A385560; ARL-TR-2306; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A signal processing technique is presented for correcting imbalances and distortions introduced to the signals by the phase detectors of a coherent wideband radar. The signal model and sources of signal errors are described, an analytic description of how the corrections are derived is provided, and a sample application is presented with the use of simulated data. This report has been prepared in anticipation of a subsequent report in which the performance of this signal processing technique will be compared with the performances of several other techniques developed for similar purposes with actual data measured in the field.
DTIC
Correction; Signal Processing; Coherent Radar; Error Analysis

20010020308 Conceptual MindWorks, Inc., San Antonio, TX USA
Statistical Aspects of Optical or Microwave Measurements of Material Properties ***Final Report, Jun. 1997-Sep. 2000***
Block, Michael G.; Albanese, Richard A.; Sep. 2000; 21p; In English
Contract(s)/Grant(s): F41622-96-D-0008; AF Proj. 7757
Report No.(s): AD-A385558; AFRL-HE-BR-TR-2000-0118; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We seek a deeper understanding of the effect of noise on the measurement of material properties. We have found very few articles on the issue of measurement error associated with optical systems or antenna apertures that might be used to measure material properties. This report is an initial study of apertures and errors that may be associated with the use of apertures in the measurement of material properties. Bandwidth limited white noise generated by using the Rice algorithm is simulated in the aperture. Using a Legendre curve fitting technique, the diffraction pattern was smoothed and image resolution was enhanced. Since the diffraction pattern first minimum permits estimation of radiation frequency, the effect of input noise on the location of the first minimum of the diffraction pattern was evaluated.
DTIC
Optical Measurement; Error Analysis; Antennas; Apertures

20010020395 NASA Marshall Space Flight Center, Huntsville, AL USA

Comment on "Heterodyne Lidar Returns in the Turbulent Atmosphere: Performance Evaluation of Simulated Systems"

Frehlich, Rod, Colorado Univ., USA; Kavaya, Michael J., NASA Marshall Space Flight Center, USA; [2000]; 12p; In English

Contract(s)/Grant(s): NAG8-1551; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The explanation for the difference between simulation and the zero-order theory for heterodyne lidar returns in a turbulent atmosphere proposed by Belmonte and Rye is incorrect. The theoretical expansion is not developed under a square- law-structure function approximation (random wedge atmosphere). Agreement between the simulations and the zero-order term of the theoretical expansion is produced for the limit of statistically independent paths (bi-static operation with large transmitter-receiver separation) when the simulations correctly include the large-scale gradients of the turbulent atmosphere.

Author

Performance Tests; Performance Prediction; Optical Radar

20010020431 Department of Defense, Office of the Inspector General, Arlington, VA USA

DOD Compliance with the Information Assurance Vulnerability Alert Policy

Dec. 01, 2000; 58p; In English

Report No.(s): AD-A384787; IG/DOD-D-2001-013; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The Deputy Secretary of Defense issued an Information Assurance Vulnerability Alert (IAVA) policy memorandum on 30 Dec 1999. Recent events demonstrated that widely known vulnerabilities exist throughout DoD networks, with the potential to severely degrade mission performance. The policy memorandum instructs the Defense Information Systems Agency to develop and maintain an IAVA database system that would ensure a positive control mechanism for system administrators to receive, acknowledge, and comply with system vulnerability alert notifications. The IAVA policy requires that the Commander in Chief, Services, and Defense agencies to register and report their acknowledgement and of compliance with the IAVA database. According to the policy memorandum, the compliance data to be reported should include the number of assets affected, the number of assets in compliance, and the number of assets with waivers. The audit objective was to evaluate the progress that DoD made in complying with the Deputy Secretary of Defense policy memorandum on IAVA.

Author

Data Bases; Information Systems; Policies; Vulnerability

20010020440 Defence Research Establishment Ottawa, Ottawa, Ontario Canada

An Analysis of RADARSAT2 SAR-GMTI Performance for Standard Beam Mode

Chiu, Shan; Dec. 2000; 55p; In English

Report No.(s): AD-A385571; DREO-TR-2000-088; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Canada's RADARSAT2 (R2) commercial SAR satellite will have an experimental operating mode that will allow ground moving target indication (GMTI) measurements to he made with received data. This mode is also called MODEX (Moving Object Detection Experiment). In the GMTI or MODEX mode of operation, the spacecraft's radar antenna is partitioned into two apertures that sequentially observe the scene of interest from the same points in space. Data is simultaneously and coherently received from both apertures and is down-linked in parallel channels for processing to extract moving target radial speeds in their SAR image context. This paper provides an analysis of SAR-GMTI performance at the R2 Standard Beam Mode based on computer modeling and simulations. Two SAR-MTI processing approaches are being explored. One utilizes the classical DPCA clutter cancellation technique to provide sub clutter visibility for dim slowly moving targets. The other is based on the along-track (temporal) SAR interferometer technique, where amplitude and phase information of the slow-moving targets are exploited to allow their extraction from the dominant clutter background. Performances of the two approaches are compared. Effects of target signal contamination by background clutter is also examined. The results indicate that the two processing approaches are similar in their GMTI performance.

DTIC

Synthetic Aperture Radar; Moving Target Indicators; Signal Processing; Parallel Processing (Computers); Target Acquisition

20010020460 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA

Internet over the VDL-2 Subnetwork; the VDL-2/IP Aviation Datalink System

Grappel, R. D.; Oct. 20, 2000; 84p; In English

Report No.(s): PB2001-101252; NASA/G-2; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report describes the design to operate the standard Internet communications protocols (IP) over the VHF aviation Data Link Mode 2 (VDL-2) subnetwork. The VDL-2/IP system specified in this report can operate transparently with the current aviation users of VDL-2 (Airline Communications and Reporting System, ACARS and Aeronautical Telecommunications Network,

ATN) and proposed users (Flight Information Service via Broadcast, FIS-B). The VDL-2/IP system provides a straightforward mechanisms to utilize inexpensive, commercial off-the-shelf (COTS) communications packages developed for the Internet as part of the aviation datalink system.
NTIS
Internets; Computer Programming; Data Links; Communication Networks; Telecommunication; Airline Operations

20010020688
High energy electromagnetic cascades in dense media: present status and prospects
Slowinski, B.; Dec. 31, 1998; 16p; In English
Report No.(s): DE99-602099; JINR-E-1-97-382; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A general overview of the present experimental status is given about the main, from the practical point of view, characteristics of electromagnetic cascades created in dense amorphous and homogeneous media at energy above 100 MeV. The problem of searching for scaling description of these characteristics is emphasized. The development of electromagnetic cascades in aligned crystals and polycrystal media is briefly discussed.
NTIS
Electromagnetic Radiation; Amorphous Materials

20010020756 California Univ., California PATH Program, Berkeley, CA USA
Los Angeles FOT Spread Spectrum Radio Traffic Signal Interconnect Evaluation Task: Final Report on Full Deployment *Final Report*
Li, Victor O. K., California Univ., USA; Sengodan, Senthil, California Univ., USA; Chan, Tat-Keung Ken, California Univ., USA; Zhuge, Lei, California Univ., USA; Oct. 1998; ISSN 1055-1417; 114p; In English; Original contains color illustrations
Report No.(s): PB2001-102265; UCB-ITS-PWP-98-27; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy
Spread spectrum radio technology, in addition to being widely used in military applications, holds enormous promise for commercial applications. The City of Los Angeles is investigating the use of spread spectrum radio networks (SSRN) for traffic monitoring and control. The University of Southern California (USC) is an independent evaluator of the project. This report presents the results obtained by USC in the evaluation of the full deployment of 100 radios in the Los Angeles Department of Transportation (LADOT) SSRN project.
NTIS
Deployment; Traffic Control; Radio Communication; Spread Spectrum Transmission; Systems Engineering

20010020765 Mississippi Univ., Dept. of Electrical Engineering, University, MS USA
Applied Computational Electromagnetics Society Journal. Special Issue on Computational Electromagnetic Techniques in Mobile Wireless Communications. Volume 15, Number 3, 2000
Perez, Ray; Holloway, Chris; Kishk, Ahmed; Glisson, Allen; Jan. 2000; 145p; In English
Report No.(s): AD-A385510; ISSN 1054-4887; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
TABLE OF CONTENTS: A Random Phase Assisted Ray Tracing Technique for Wireless Channel Modeling; Nanocells Intrasystem Interference Realistic Worst Case Analysis for Open Site Personnal Communication Scenarios; Designing Embedded Antennas for Bluetooth Protocol; Analysis and Design of Tapered Meander Line Antennas for Mobile Communications; A Cole-Cole Diagram Representation of Micro strip Structure; Enhancement of Numerical Computation Methods Useful for Radio Communication Antenna Systems; Time and Frequency Domain Wave Propagators; Ray Tracing Techniques for Mobile Communications; On the Feasibility of the Multipath Fingerprint Method for Location Finding in Urban Environments; and New Designs for Dual Band Antennas for Satellite Mobile Communications Handsets.
DTIC
Computational Electromagnetics; Mobile Communication Systems; Wireless Communication; Numerical Analysis

20010020835 National Telecommunications and Information Administration, Washington, DC USA
Vulnerability of Wireline and Cellular Telecommunications Networks to High Power Radio Frequency Fields
Wilson, Perry, National Telecommunications and Information Administration, USA; Haakinson, Eldon, National Telecommunications and Information Administration, USA; Dalke, Roger, National Telecommunications and Information Administration, USA; Nov. 2000; 48p; In English
Report No.(s): PB2001-102225; NTIA-01-382; Copyright; Avail: National Technical Information Service (NTIS)
This report examines the vulnerability of public and emergency telecommunications networks to high power RF fields, at the network and nodal levels. The assessment of network level vulnerability requires an examination of the system architecture

and how redundancy and robustness are used to compensate for nodal loss or overload. The overall public telecommunications network has sufficient redundancy and capacity to withstand the loss of even multiple nodes. A full system collapse is not envisioned as a possible scenario. However, large local blackouts are possible.
NTIS
Vulnerability; Telecommunication; Electronic Equipment; Radio Frequencies; Communication Equipment

20010020930 Communications Research Lab., Japan
Wave Summit Course: Digital Broadcasting
Shiomi, Tadashi, Editor, Communications Research Lab., Japan; Hatori, Mitsutoshi, Editor, Communications Research Lab., Japan; [2000]; 302p; In English
Report No.(s): LC-00-109994; ISBN 4-274-90381-8; Copyright; Avail: Issuing Activity

In October 1896, one year after the success of Marconi's wireless telegraphy experiments, Japan started research into wireless telegraphy at the Electrical Technical Laboratory of the Ministry of Communications. The following year, Mr. Matsunosuke Matsushiro found success in his wireless telegraphy experiments. The Radio Research Laboratories, Ministry of Posts and Telecommunications, was established in 1952 after some reorganization of the laboratories researching radio communication technology. The Radio Research Laboratories was renamed the Communications Research Laboratory in 1988 to reflect the change in the environment for research following the privatization of the Nippon Telegraph and Telephone Corporation in Japan. to celebrate 100 years of radio communications, we have spent several years at the Communications Research Laboratory planning and preparing to publish in book from the results of the research so far conducted. Entitled the "Wave Summit Course," it will contain a series of papers on various aspects of radio communications technology and is aimed at students of both the senior and graduate levels, that is, the generation of scientists who will lead the way in the 21st century. Now the time for publication has arrived. This series consists of seven volumes: 'Satellite Communications,' 'Very Long Baseline lnterferometer,' 'Science of Space Environment,' 'Modern Millimeter-Wave Technologies,' 'Digital Broadcasting,' 'Mobile Communications,' and 'Global Environment Remote Sensing.' We hope that these volumes will be widely read as useful guides to the different fields in which radio waves are used.
Derived from text
Broadcasting; Radio Communication; Telecommunication; Telegraph Systems

20010021189 Lembaga Penerbangan dan Antariksa Nasional, Space Meteorology, Atmosphere Research and Development Center, Jakarta, Indonesia
Temporal and Spatial Variations of Outgoing Longwave Radiation in the Indonesian Region from 1996 to 1998 ***Variasi Temporal Dan Spasial Outgoing Longwave Radiation Di Wilayah Indonesia Selama Periode 1996-1998***
Visa, Juniarti, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Hidayati, Rukmi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Harjana, Teguh, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Safrudin, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; July 2000; ISSN 0126-9754; Volume 2, No. 3, pp. 115-118; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The outgoing longwave radiation (OLR) over the Indonesia area was analyzed by using NOAA 12, 14 satellite data and terascan software Version 2.6. The results show that in 1996-1998 the value of OLR are between 230-320 W/sq m. Generally the values in dry season are higher than in wet season. During ENSO 1997/1998 the OLR in November to February is higher than the same period in the normal year. Spatial analysis shows that central part of Indonesia (Bali, Nusa Tenggara, Sulawesi, and part of Kalimantan) have higher OLR than in other regions.
Author
Long Wave Radiation; Temporal Distribution; Spatial Distribution

20010021253 Helsinki Univ. of Technology, Dept. of Electrical and Communications Engineering, Espoo, Finland
Polarizability Analysis of Cubical and Square-Shaped Dielectric Scatterers
Avelin, Juha, Helsinki Univ. of Technology, Finland; Sharma, Reena, Helsinki Univ. of Technology, Finland; Haenninen, Ilari, Helsinki Univ. of Technology, Finland; Sihvola, Ari, Helsinki Univ. of Technology, Finland; 1999; ISSN 1456-632X; 18p; In English
Report No.(s): PB2000-102627; Rept-303; ISBN 951-22-4609-0; No Copyright; Avail: National Technical Information Service (NTIS)

The polarizability characteristics of non-spherical scatterers, especially ares, studied in the present paper. A surface integral equation for the electrostatic potential has been numerically solved for a cube and a square shaped object. Non-uniform discretisation of the dielectric object has been used to get a good accuracy in the solution. THe results obtained for the polarizability of cubes

using the surface integral equation are compared with those obtained from the volume integral equation and show a good agreement. We give simple approximation formulas for the polarizabilities as functions of the permittivity of the inclusions.
Author
Polarization Characteristics; Cubes (Mathematics); Nonuniformity; Permittivity; Scattering; Squares (Mathematics)

20010021391 Michigan Univ., Dept. of Nuclear Engineering and Radiological Sciences, Ann Arbor, MI USA
High Power Microwave Generation from a High Current Diode ***Final Report, 1 Jun. 1997 - 31 May 2000***
Lau, Y. Y.; Nov. 19, 2000; 8p; In English
Contract(s)/Grant(s): F49620-97-1-0429; AF Proj. 3484
Report No.(s): AD-A385250; AFRL-SR-BL-TR-00-0688; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Over its three year period, this AASERT grant supported a large number of undergraduate and graduate students at various levels at the University of Michigan. The supported students are all US citizens. Their major achievements include: (1) First applications of time-frequency analysis to a high power gyrotron and to a conventional magnetron. (2) An in-depth analysis of transient limiting current in a diode. (3) Spectroscopic analysis that identifies water as a major culprit that triggers pulse shortening in HPM sources. (4) Initiation of an experiment of multipactor on a dielectric. (5) In-depth study of AC Stark broadening and its application to HPM.
DTIC
Diodes; Microwaves; Cyclotron Resonance Devices; Electric Generators

20010021557 Defence Research Establishment Ottawa, Ottawa, Ontario Canada
Digital Automatic Gain Control (DAGC) for Surveillance Radar Applications: Theory and Simulation
McDonald, Michael K.; Oct. 2000; 46p; In English
Contract(s)/Grant(s): Proj. 3DB29
Report No.(s): AD-A385632; DREO-TR-2000-115; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The potential for using a digital automatic gain control (DAGC) is examined. The DAGC operates by digitally storing a clutter map of the average of past returns. This average clutter map is digitally filtered to remove small spatial variations and the resulting values are used to adjust the front end receiver gain. In contrast a traditional analog automatic gain control (AAGC) uses real time filtered feedback to control the adjustable front end gain. The physical realizability constraints of an AAGC typically result in a wider shadow zone for regions where the scan is moving from a land to sea clutter environment. It is shown that the DAGC filtering operation on the clutter map of past returns allows the spatial extent of the filter to be distributed evenly across the land-sea transition regions thereby reducing the shadow zone. The AAGC is shown to display slightly superior noise performance over the DAGC approach. Simulations of the behaviour of both systems under simplified configurations are also shown to qualitatively illustrate and clarify the tradeoffs associated with either approach.
DTIC
Automatic Gain Control; Surveillance Radar; Search Radar

20010021669 National Inst. of Standards and Technology, Electromagnetic Technology Div., USA
Bibliography of Publications of the NIST Electromagnetic Technology Division
Metz, Sara, Editor, National Inst. of Standards and Technology, USA; December 2000; 49p; In English
Report No.(s): PB2001-101516; Copyright; Avail: National Technical Information Service (NTIS)

This bibliography lists the publications of the staff of the Electromagnetic Technology Division of NIST during the period from January 1970 through July 1999. The bibliography's main section, Cryoelectronic Metrology, lists citations in the following project areas: Josephson Array Development; Nanoscale Cryoelectronics; High-Performance Sensors, Infrared Detectors, and Mixers; and High-Tc Electronics. The most recent publications are listed first and arranged alphabetically by authors' names.
NTIS
Cryogenic Equipment; Electronic Equipment; X Ray Detectors; Josephson Junctions; Superconductivity

20010021750 Communications Research Centre, Ottawa, Ontario Canada
A Simulation of P_MUL (An Application for Multicast Messaging Under EMCON Restriction)
Bilodeau, Claude; Dumoulin, Sarah; Jun. 2000; 118p; In English
Report No.(s): AD-A385146; CRC-RP-2000-005; DREO-TR-2000-048; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

P_MUL is an application layer reliable multicast protocol specifically designed for use over narrowband where nodes may be operating in EMCON (Emission Control) or radio silence mode. The protocol is specified in the Allied Communication Publi-

cation (ACP) 142.The Communication Research Centre (CRC) has created discrete-event simulation model of P_MUL in order to characterize its performance under variety of operating conditions. Simulation scenarios were created to examine the effectiveness of P_MUL in both noise-free and noisy channel environments. The scenarios focus on the impact of protocol parameters on the results obtainable by P_MUL. This report describes the CRC model of P_MUL and outlines the simulation scenarios studies. Analysis of simulation results is provided, weaknesses of the protocol are identified, and optimal values for certain protocol parameters are suggested.
DTIC
Mathematical Models; Protocol (Computers); Massaging

33
ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also 60 Computer Operations and Hardware; and 76 Solid-State Physics. For communications equipment and devices see 32 Communications and Radar.

20010019832 North Carolina State Univ., Dept. of Electrical and Computer Engineering, Raleigh, NC USA
SiC Discrete Power Devices ***Final Report, 1 Jan. 1999 - 31 Dec. 2000***
Chilukuri, Ravi K.; Baliga, B. J.; Jan. 01, 2001; 130p; In English
Contract(s)/Grant(s): N00014-96-1-0363; Proj. 97PR00099-00
Report No.(s): AD-A385108; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A novel planar vertical MOSFET structure, called ACCUFET, which eliminates both the problem of premature oxide breakdown and low inversion layer mobility has been demonstrated at Power Semiconductor Research Center. The contributions of the parasitic JFET regions in the ACCUFET to its forward conduction and forward blocking characteristics are discussed for the first time. A new process for fabrication of high voltage 4H-SiC ACCUFETs has been designed using insights gained. The process induced variations of the key design parameters of an ACCUFET are discussed. The fabrication of devices such as the Junction Barrier Schottky (JBS) diodes and the Junction Field Effect Transistors (JFET) is compatible with this process without the use of any additional mask levels or process steps. The forward conduction characteristics of 4H-SiC ACCUFETs, fabricated on starting material with different epilayer doping and thickness values, are presented. The effect of the key design parameters such as the channel length, the buried JFET region width, and the gate oxide thickness, and the effect of their process-induced variations on the performance of these devices are discussed. Further, an analytical model developed previously for the on-resistance of the devices has been verified with the aid of the experimental results.
DTIC
Planar Structures; Field Effect Transistors; Silicon Carbides; Semiconductors (Materials); Schottky Diodes; Junction Diodes

20010019988 NASA Goddard Space Flight Center, Greenbelt, MD USA
Crane Cell Testing Support of NASA/Goddard Space Flight Center: An Update
Strawn, Mike, Naval Surface Warfare Center, USA; David, Jerry, Naval Surface Warfare Center, USA; Rao, Gopalakrishna M., NASA Goddard Space Flight Center, USA; [2001]; 48p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of this paper is to verify the quality and reliability of aerospace battery cells and batteries for NASA flight programs, disseminate the data - to develop a plan for in-orbit battery management - to design a cell/battery for future NASA spacecraft and establish a cell test data base for rechargeable cell/batteries.
Derived from text
Electric Batteries; Cranes

20010020148 Texas Univ., Microelectronics Research Center, Austin, TX USA
Polymer-Based Multi-Mode Coplanar Asymmetrical Unidirectional Waveguide Modulator for Multi-Wavelength ***Final Report, 15 Jun. 1997-14 Jun. 2000***
Sun, Degui, Texas Univ., USA; Lu, Xuejun, Texas Univ., USA; Taboada, John M., Texas Univ., USA; Dubinovsky, Michael, Texas Univ., USA; Tang, Huajun, Texas Univ., USA; Jun. 2000; 52p; In English
Contract(s)/Grant(s): F49620-97-1-0496
Report No.(s): AD-A385781; 26-0202-25; AFRL-SR-BL-TR-01-0028; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

A unidirectional electro-optic modulator based on polymeric highly multi-mode waveguides was constructed using the standard VLSI techniques. A high unidirectional coupling efficiency of 100% Was achieved. A high modulation depth of 99% was also experimentally achieved at 633nm wavelength. The modulator was packaging enhanced by vertically configuring the guiding multi-mode waveguide and the dumping planar waveguide. The device packing density improved by a factor of two. Based on the same configuration, a packaging enhanced polarization-insensitive thermo-optic was also built. The switch operating at wavelengths of 632.8nm and 1.3 micrometers has been demonstrated experimentally with extinction ratios of 21dB and 22dB, respectively. Such devices have an intrinsic wide optical bandwidth due to the large dynamic range of the phase-matching condition implied by the multi-mode waveguides. These devices can be used in optoelectronic interconnects for data communications.
DTIC
Waveguides; Modulators; Asymmetry; Electro-Optics; Ferroelectric Materials

20010020296 Michigan Univ., Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI USA
GaN MISFETs ***Final Report***
Pavlidis, Dimitris; Jun. 13, 2000; 6p; In English
Contract(s)/Grant(s): N00014-99-1-0513
Report No.(s): AD-A385757; ONR-00-1; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Objectives are to conduct experimental and theoretical studies to demonstrate and analyze the advantages offered by AlN/GaN MISFETs: MOCVD Growth of high-quality AlN/GaN heterostructures; Simulate AlN/GaN MIS structures and MISFETs; Develop high-power AlN/GaN MISFETs and Amplifiers; Characterize DC, low- and high-frequency, and power performance of AlN/GaN MISFETs.
DTIC
MIS (Semiconductors); Field Effect Transistors; Metalorganic Chemical Vapor Deposition

20010020300 California Inst. of Tech., Pasadena, CA USA
An Ultra-Fast All-Optical Error Detection and Correction Circuit Based on Spectral Logic ***Final Report***
Bhardwaj, Ashish; Hedekvist, Olof; Vahala, Kerry; Aug. 14, 2000; 11p; In English
Contract(s)/Grant(s): F49620-98-1-0409
Report No.(s): AD-A385591; AFRL-SR-BL-TR-00-0684; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
All-optical logic circuits based on the polarization properties of non-degenerate four-wave mixing are proposed. It is shown that higher-level Boolean operations involving several bits can be implemented without resorting to the standard 2-input gates. As a simple illustration of the idea, a circuit performing error correction on a (3, 1) Hamming Code is demonstrated. Error-free performance (Bit Error Rate of less than 10(exp -9) at 2.5 Gbit/s is achieved after single-error correction on the Hamming word with 50 percent errors.
DTIC
Logic Circuits; Optical Communication; Spectra; Error Detection Codes

20010020309 Systems and Electronics, Inc., Elk Grove Village, IL USA
Independent Power Supply Investigation Configuring Supercapacitor Applications and Other Loading Technologies Power Sources ***Final Report, 28 Mar.-21 Dec. 2000***
Sepka, Thomas J.; Dec. 21, 2000; 44p; In English
Contract(s)/Grant(s): F33615-00-C-2044
Report No.(s): AD-A385557; SEI-491-00-05; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
SEI conducted a trade-off and engineering analysis for the employment of supercapacitors and other energy sources for an independent power supply for flight recorders (data acquisition systems), and other avionics systems requiring standby power for short periods of time, from 200 milliseconds to 20 minutes. For this research program, SEI targeted avionics systems requiring 10 to 20 watts for a period of 20 minutes. The objective of the Phase I research was to develop a design, conduct a trade-off and engineering analysis and to prove the design concept through an extensive review of the capabilities of commercial off-the-shelf (COTS) capacitors for use in SEI's development. In addition, the Phase I study was also intended as a means to demonstrate the feasibility of SEI's proposed supercapacitor design through laboratory tests.
DTIC
Capacitors; Aircraft Power Supplies; Auxiliary Power Sources

20010020362 University of Southern California, Dept. of Chemistry, Los Angeles, CA USA

Synthesis and Processing of Improved Second Order Nonlinear Optical Materials ***Final Report, 1 May 1997-30 Apr 2000***

Dalton, Larry R.; Sep. 15, 1999; 22p; In English

Contract(s)/Grant(s): F49620-97-1-0307

Report No.(s): AD-A385791; AFRL-SR-BL-TR-01-0015; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Polymeric EO modulators operating with drive voltages of 0.8-4.5 volts, bandwidths of 150 GHz, and insertion losses on the order of 5-6 dB have been demonstrated. These modulators have also been packaged as 3-D circuit structures and integrated directly with VLSI semiconductor electronics and with silica fiber optics. A variety of new device structures including phased array radar, ultrafast analog-to-digital converters, polarization insensitive modulators, ultrahigh bandwidth oscillators, and spatial light modulators have been demonstrated. New condensed matter theory has been developed which is capable of correctly predicting for all concentration regimes the behavior of many-body, spatially-anisotropic, long-range electrostatically-interacting dipolar molecules. This theory has guided the dramatic improvement in organic EO materials.

DTIC

Light Modulators; Optical Materials; Electro-Optics; Fiber Optics; Synthesis (Chemistry)

20010020387 NASA Langley Research Center, Hampton, VA USA

RF Loading Effects of Aircraft Seats in an Electromagnetic Reverberating Environment

Nguyen, Truong X., NASA Langley Research Center, USA; December 2000; 12p; In English

Contract(s)/Grant(s): RTOP 522-14-21-02

Report No.(s): NASA/TM-2000-210626; NAS 1.15:210626; L-18047; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Loading effects of aircraft seats in an electromagnetic reverberating environment are investigated. The effects are determined by comparing the reverberation chamber's insertion losses with and without the seats. The average per-seat absorption cross-sections are derived for coach and first class seats, and the results are compared for several seat configurations. An example is given for how the seat absorption cross-sections can be used to estimate the loading effects on the RF environment in an aircraft passenger cabin.

Author

Reverberation; Seats; Aircraft Compartments; Radio Frequencies; Environmental Tests; Reverberation Chambers

20010020419 Cornell Univ., School of Electrical Engineering, Ithaca, NY USA

Millimeter-Wave Quasi-Optical MEMS Steered MMIC Amplifier Array ***Final Report, 1 Oct. 1999 - 30 Sep. 2000***

Neves, Hercules P.; Wright, Warren; Dec. 10, 2000; 27p; In English; Original contains color plates

Contract(s)/Grant(s): DAAG55-97-1-0266

Report No.(s): AD-A385747; ARO-37389.3-EL; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The development of a 44 GHz MEMS-steered solid-state amplifier array with 100 active elements has been studied. The array has a layered geometry with 10 layers of microstrip circuitry, each containing 10 amplifier/MEMS phase shifter elements configured in parallel as a power combining microstrip/parallel plate waveguide combiner. The final strategy for the grating array and layer array amplifiers was implemented and tested. This involved the construction of a compact array amplifier with a beam launcher consisting of an h-plane sectoral horn with an anti-reflection lens. For loss and reflection optimization, several step geometries were studied for the transition to parallel plate. A split transition scheme was introduced for the transition between parallel plate and microstrip. The MEMS phase shifter fabrication process was studied in more detail to expand the total phase shifting range. Severe reliability issues were encountered, especially in terms of DC isolation of the top metal layer. Different techniques have been used to alleviate this problem, which included using different release methods and the use of a wet metal etch. Additionally, a new process for obtaining more compliant MEMS springs without affecting transmission line parameters was successfully developed, therefore allowing actuation of our phase shifters at lower operating voltages.

DTIC

Integrated Circuits; Microwave Amplifiers; Microelectromechanical Systems; Microwave Circuits; Phase Shift Circuits; Fabrication

20010020439 Defence Research Establishment Ottawa, Ottawa, Ontario Canada

QWIP-LED/CCD Coupling Study ***Final Report***

Chiu, Shan; Scott, Al; Nov. 2000; 62p; In English

Report No.(s): AD-A385572; DREO-TR-2000-101; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Many space-based imaging applications demand a sensitive, low noise long wavelength IR detector which is able to image a wide field of view in a short time. Quantum Well Infrared Photodetector (QWIP)-LED detectors offer the potential for large imaging area, and ultra-low noise operation when cooled to cryogenic temperatures (approx. 30K). Due to these factors the QWIP-LED holds a significant advantage over conventional detectors. It is in the area of system efficiency, however, that current QWIP-LEDs are less competitive for low signal space applications. This study was a collaborative effort between EMS technologies, DND, CRESTech and NRC with a goal to design and implement a method to increase the efficiency of QWIP-LED systems. As a result of this study, it has become apparent that early projections about the cost, quality, and efficiency of pixel-less QWIP-LED technology were highly optimistic regarding critical implementation details. Unforeseen difficulties with the application of

DTIC

Infrared Detectors; Light Emitting Diodes; Quantum Wells; Charge Coupled Devices; Photometers; Technology Utilization

20010020632

Investigational study of optical function materials for two-dimensional data processing

Mar. 31, 1998; 198p; In Japanese

Report No.(s): DE99-700647; NEDO-TR-9709; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The paper investigated/studied 'space light modulation materials, dynamic hologram/memory materials, optical waveguide path materials,' etc. which become key materials in the high speed two dimensional processing. As to electrooptical materials proposed in this investigational study, the external electric field and the electric charges generated make quality of molecules themselves directly change to memory strong/weak signals of light. Therefore, the response velocity becomes less than a millionth of that of the liquid crystal display, and high speed which is needed for real time moving image processing is anticipated. Hologram includes the phase information in addition to information on light strength. Therefore, it is a large capacity record medium and at the same time a record medium which can read/write two dimensional information as it is. With optical fiber, images cannot be transmitted as they are. Light waveguide path materials are those that accumulate roles of mirror and lens in a sheet of the material and construct a system which is strong in vibration, as optical parts connecting among materials for two dimensional data processing.

NTIS

Data Processing; Light Modulation; Holography; Memory

20010020783

Implementation of microelectronic components in nuclear application

Ashour, M.; Dec. 31, 1997; 18p; In English

Report No.(s): DE99-606797; AREAEA-343; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

As the next logical step in the evolution of programmable devices, Field programmable interconnect components (FPIC) bring the benefits of programmability to the system-level by enabling totally "programmable hardware." Continuing what was started by programmable memories twenty years ago and then enhanced by programmable logic ten years later, programmable interconnect holds the key to complete system programmability. History has shown that flexibility is the key benefit realized by programmable technologies (see figure 1). Initially used in a lab environment for design verification purposes, programmable technologies enhance development and ease of experimentation. As experience by more users is accumulated, performances improves and component prices are reduced, applications rapidly expand to address highly flexible and quickly implemented final manufactured products. With similar attributes of it's programmable predecessors, FPIC technology provides an attractive solution to the design verification problems of today and the manufacturing challenges of tomorrow.

NTIS

Microelectronics; Integrated Circuits

20010021084

R and D of the superconducting material and device (technical development of the Josephson device hybrid system), *FY 1997*

Mar. 31, 1998; 137p; In Japanese

Report No.(s): DE99-707604; ETDE/JP-99707604; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In order to establish basic technology for hybrid systems of superconducting and semiconducting devices, study was made on ultrahigh speed and low energy consumption properties of Josephson devices. As Josephson IC technology, a logical circuit, ring network, memory circuit, and oxide superconductor logical circuit were studied. As superconducting hybrid system technology, a Josephson device-semiconductor device interface, formation technology of signal transmission lines, and Josephson-MOS IC technology were developed. In fiscal 1997, as Josephson IC technology, switch motion of 4 GHz in clock frequency was achieved by new high-density wiring process. Integration of some semiconducting processor elements, junction of surface-stabilized superconducting thin films, and motion of combination structure of some SQUIDs were also confirmed. On the hybrid system, voltage conversion operation of all interfaces was confirmed. Proper logical operation of the Josephson device hybrid circuit was also confirmed.

NTIS

Superconductors (Materials); Superconducting Devices; Semiconductor Devices; Hybrid Circuits; Josephson Junctions

20010021089

Report on the results of research and development under a consignment from NEDO on deca-nano quantum integrating transistor substrate technologies

Mar. 31, 1998; 146p; In Japanese

Report No.(s): DE99-707615; ETDE/JP-99707615; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Researches have been conducted on deca-nano quantum integrating transistor substrate technologies, and developments were made on a three-dimensional device simulator which can be used in deca-nano domains, and a circuit simulator to have quantifying function transistors coexist with silicon semiconductor integrated circuits. The researches were intended to develop a simulator capable of analyzing properties of very small silicon and compound semiconductor devices in deca-nano domains. The researches discussed the applicability of conventional simulators, calculated quantum levels in a three-dimensional hetero structure, and resulted in development of an electron wave propagation simulator in optional two-dimensional shapes, a quantum Monte Carlo simulator, and a three-dimensional semiconductor device simulator with quantum correction. On the other hand, in order to estimate characteristics of a hybrid circuit in which single electron transistors coexist with conventional transistors such as CMOS transistors, a single electron hybrid circuit simulator was developed. The development indicated that a CMOS-SET fused memory is promising as a future LSI memory.

NTIS

Transistors; Simulators

20010021093

FINPIE/97. Workshop proceedings

Dec. 31, 1997; 159p; In English; 1997 Finnish workshop on power and industrial electronics

Report No.(s): DE99-705831; NEI-FI-350; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This publication contains the proceedings of 1997 Finnish Workshop on Power and Industrial Electronics, held in Espoo, Finland, on 26 August, 1997. The program consisted of technical sessions on Advanced AC Motor Control, Electric Machines and Drives, Advanced Control and Measurement, Power Electronics Systems, Modelling and Simulation, and Power Converters.

NTIS

Conferences; Electric Power Supplies; Electric Motors

20010021104

DA(Phi)NE cryogenic system

Modena, M.; Dec. 31, 1997; 13p; In English

Report No.(s): DE99-603705; LNF-IR-97-046; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The DA(Phi)NE Project utilizes superconductivity technology for a total of six superconducting magnets: the two Experiment magnets (KLOE and FINUDA) and the four Compensator Solenoid magnets needed to compensate the magnetic effect of the Experiment magnets on the electron and positron beams. This effect, on beams of 510 MeV (nominal DA(Phi)NE Energy), is expected to be relevant, especially with the aim of achieving a very high luminosity, which is the main target of the Project. The KLOE superconducting magnet has two possible working positions: the first in the DA(Phi)NE Hall, when the Experiment

will be in operation, and the second one in the KLOE Assembly Hall. This second position is the first to be utilized for the KLOE magnet Acceptance Test and magnetic field mapping, prior to the mounting of all the experimental apparatus inside the magnet. This note intends to present the DA(Phi)NE Cryogenic System and how the authors have converged to the definition of a common Cryogenic System compatible with all the six superconducting magnets.
NTIS
Cryogenics; Superconductivity; Magnetic Effects; Magnetic Fields; Superconducting Magnets

20010021149
Research and development of superconducting materials and transistors (report on overall investigation of superconductive devices), *FY 1997*
Mar. 31, 1998; 210p; In Japanese
Report No.(s): DE99-707611; ETDE/JP-99707611; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This paper describes development of superconducting new function transistors. Fiscal 1997 as the final year of the project advanced improvement in such transistor-using processes as formation and micro-processing of superconducting thin films to show enhancement in characteristics of high-temperature superconducting transistors and possibility of their application utilizing their high speed motions. Furthermore, fundamental technologies were studied with an aim on junction transistors to be applied as circuits. For field effect transistors, evaluation was performed on critical current distribution of step-type particle boundary junction to make it possible to evaluate characteristics of hundreds of transistors. At the same time, a magnetic flux quantum parametron gate with three-layer structure was fabricated to identify its operation. In superconducting-base transistors, strong reflection was recognized on temperature dependence of permittivity of an Nb-doped strontium titanate substrate used for collectors, by which barrier height was reduced. In the junction transistor and circuit technology, isotropic ramp-edge junctions were fabricated, and so was a frequency divider circuit with single magnetic flux quantum mode operation for evaluating high-speed response characteristics. High time resolution current was observed successfully by using a high-temperature superconducting sampler system.
NTIS
Superconducting Devices; Field Effect Transistors; High Temperature Superconductors

20010021165 Department of the Navy, Washington, DC USA
A Photonic Analog-to-Digital Converter Utilizing Wavelength Division Multiplexing and Distributed Optical Phase Modulation
Curry, Marc, Inventor; Dec. 01, 2000; 24p; In English
Patent Info.: Filed 1 Dec. 2000; US-Patent-Appl-SN-09,726,616
Report No.(s): AD-D019745; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
A new pipeline method and apparatus for photonic analog-to-digital converters (ADCs) utilizing wavelength division multiplexing (WDM) and distributed phase modulation is disclosed. The analog-to-digital conversion is performed within the optical system of the ADC, and thus the optical output is a digital bit pattern. The optical output of this system thus facilitates ADC conversion at much higher speeds than available with conventional electronic ADCs. Phase modulators and polarization based optics are used to map an input analog waveform into a binary output.
DTIC
Patent Applications; Photonics; Analog to Digital Converters

20010021166 Department of the Navy, Washington, DC USA
Method for Coating Small Particles
Bayya, Shyam S., Inventor; Oct. 31, 2000; 28p; In English
Patent Info.: Filed 31 Oct. 2000; US-Patent-Appl-SN-09/699,396
Report No.(s): AD-D019746; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
The coating method includes the steps of dissolving coating precursor(s) in a solvent to form a precursor solution: adding with mixing a miscible diluent to the precursor solution to form a coating solution; admixing solid particles to the coating solution to form a coating slurry, with the particles surrounded with the coating solution; spraying the coating slurry to form droplets containing at least one particle; passing the droplets through a drying zone where the droplets are dried and form dry particles coated with a coating material formed from the coating precursor(s); heat-treating the coating material on the particles emanating from

the drying zone to remove volatile matter on the coating material, to improve integrity of the coating material and/or to effect another objective; and collecting dry coated particles.
DTIC
Patent Applications; Coatings; Coating; Particles; Flat Panel Displays

20010021307 CFD Research Corp., Huntsville, AL USA
CAD Tool for Terahertz Device Development ***Final Report, Apr.-Oct. 2000***
Stout, P.; Yuan, W.; Wordelman, C.; Przekwas, A. J.; Klimeck, G.; Oct. 2000; 47p; In English; S. J. Allen, R. C. Bowen, R. Lake. Prepared in collaboration with Jet Propulsion Laboratory, University of California, Santa Barbara, Texas Instruments and University of California, Riverside.
Contract(s)/Grant(s): ARPA ORDER-D611/79
Report No.(s): AD-A385541; CFDRC-8278/2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The overall objective of this project is to develop a commercial quality, validated computer aided design (CAD) tool, THz quantum based semiconductor devices. THz device design must account for quantum effects such as quantum resonant modes, quantum mode mixing, tunneling, intersubband transitions, side wall scattering, and surface recombination. Currently, there are no CAD tools available that incorporate all the proper physics for designing THz quantum devices. The proposed quantum CAD tool will be a device simulator with the ability to investigate the operation of and generate reduced models (S-parameters) for quantum based, electronic and photonic THz sources and detectors such as quantum cascade lasers, superlattices, and multiple quantum wells.
DTIC
Computer Aided Design; Semiconductor Devices; Quantum Electronics

20010021315 National Inst. of Standards and Technology, Electronics and Electrical Engineering Lab., Gaithersburg, MD USA
Electronics and Electrical Engineering Laboratory, Semiconductor Electronics Division: Programs, Activities, and Accomplishments
Jan. 2001; 60p; In English
Report No.(s): PB2001-102726; NISTIR-6589; Copyright; Avail: National Technical Information Service (NTIS)
Partial Contents: Welcome; Mission, Vision, Values, and Goals; Semiconductors; Backbone of the Electronic/Digital Revolution; Semiconductor Electronics Division Organization; Metrology for Compound Semiconductor Manufacturing; Scanning-Probe Microscope Metrology; Thin-Film Process Metrology; Metrology for Simulation and Computer-Aided Design (includes Power Electronics); MicroElectroMechanical System (MEMS); Linewidth and Overlay Standards for Nanometer Metrology; Dielectric and Interconnect Reliability Metrology; Microfabrication Process Facility; Science Magazine Recommends Division Hall Effect Web Site As 'Hot Pick'; NITS's Gaithersburg Campus and Surrounding Area.
NTIS
Electrical Engineering; Semiconductors (Materials); Electronics; Manufacturing

20010021323 NASA Marshall Space Flight Center, Huntsville, AL USA
Electronic Model of a Ferroelectric Field Effect Transistor
MacLeod, Todd C., NASA Marshall Space Flight Center, USA; Ho, Fat Duen, Alabama Univ., USA; [2001]; 1p; In English; 13th; Integrated Ferroelectrics, 11 Mar. 2001, Colorado Springs, CO, USA
Contract(s)/Grant(s): RTOP 101-58-15; No Copyright; Avail: Issuing Activity; Abstract Only
A pair of electronic models has been developed of a Ferroelectric Field Effect transistor. These models can be used in standard electrical circuit simulation programs to simulate the main characteristics of the FFET. The models use the Schmitt trigger circuit as a basis for their design. One model uses bipolar junction transistors and one uses MOSFET's. Each model has the main characteristics of the FFET, which are the current hysterisis with different gate voltages and decay of the drain current when the gate voltage is off. The drain current from each model has similar values to an actual FFET that was measured experimentally. T'he input and o Output resistance in the models are also similar to that of the FFET. The models are valid for all frequencies below RF levels. No attempt was made to model the high frequency characteristics of the FFET. Each model can be used to design circuits using FFET's with standard electrical simulation packages. These circuits can be used in designing non-volatile memory circuits and logic circuits and is compatible with all SPICE based circuit analysis programs. The models consist of only standard electrical components, such as BJT's, MOSFET's, diodes, resistors, and capacitors. Each model is compared to the experimental data measured from an actual FFET.
Author
Ferroelectricity; Field Effect Transistors; Electronic Equipment; Electric Potential

20010021379 Kentucky Univ., Dept. of Electrical Engineering, Lexington, KY USA

High-Order Sparse Matrix Nystrom Algorithm for the Analysis of Planar Microwave Circuits ***Final Report, Aug. 1998 - Feb. 1999***

Gedney, Stephen D.; Nov. 15, 2000; 41p; In English; Original contains color plates

Contract(s)/Grant(s): DAAG55-98-1-0460

Report No.(s): AD-A385792; ARO-39075.1-EL-11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The focus of this research has been on the development of a fast high-order solution method for the analysis of large scale printed microwave circuit devices. The method is based on a high-order sparse matrix/Nystrom (SM/N) method. The goal is to develop a scheme that provides controllable accuracy, fast error convergence, and fast solutions for the simulation of large practical circuits. This intent of the 6 month STIR was to initiate this research and demonstrate a proof of concept. to this end, in this program we have developed a locally corrected Nystrom scheme that exhibits true high-order convergence for electromagnetic scattering simulations. This is demonstrated for both smooth objects, as well as objects with edge singularities. Secondly, in pursuant of a high-order scheme for the simulation of circuits printed in layered media, a fast computation of the Sommerfeld Green's functions to controllable accuracy has been developed.

DTIC

Microwave Circuits; Printed Circuits; Planar Structures; Matrices (Mathematics)

20010021533 Ljubljana Univ., Fakulteta za Elektrotehniko, Ljubljana, Slovenia

Computer Simulation in Power Electronics With Simplorer ***Simulacija Vezij Mocnostne Elektronike s Programskim Paketom Simplorer***

Bajec, Primoz, Ljubljana Univ., Slovenia; Voncina, Danijel, Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 300-305; In Slovene; Copyright; Avail: Issuing Activity

The paper presents a new computer simulation program Simplorer 4,1. This is a high performance simulation tool allowing the user quick and easy simulation of complicate technical systems in a variety of application areas, in particular in power electronics. A simulation tool and a practical analysis procedure are described consequently. For creating a precise simulation model Simplorer offers two different methods, modelling with a text editor in the SML language and modelling with a graphical input tool Schematic. Building the simulation model with the text editor requires some experience, on the other hand graphical tool is more user friendly orientated. In either case, it good overview, over the employed libraries is required. In a separate library we can find Semikrons models of diodes and IGBT transistors. Their electrical characteristics are defined with measurements on real Semikron semiconductor elements. This attribute assures object of simulation results and also gives Simplorer priority in computer simulation in the area of power electronics. The simulation model is further analysed by the Simulator containing different simulating procedures (TR. AC, DC). The quality and objectivity of the simulation result depend on the simulation parameters. They are defined with regard to the components used in the simulating model and required accuracy. In the final sequence, data evaluation takes place. Simplorer contains two data postprocessors DAY and DAY Optim. They offer many mathematical and graphical research options and also the creation of the final presentation of the entire problem analysis. Simplorer also contains an Experiment Tool that repeats the simulation and through build-in task types and user defined changeable parameters provides the optimal solution of simulated problem. At the end of the paper the practical Use of Simplorer is briefly demonstrated, dealing with single-phase inverter with Semikron switching modules. to take full advantage of the Simplorer's performance, its essential details and properties should be well known.

Author

Computerized Simulation; Alternating Current; Performance Prediction; Semiconductors (Materials); Simulators; Switching

20010021534 Trieste Univ., Electrical Engineering Dept., Italy

Equipment Fault-Clearing Time Reduction: An Approach to Utility Voltage Sag Mitigation ***Znizanje Izklopilnega Casa Naprav: Nacin za Preprecevanje Udorov Napetosti v Distribuciji***

Tosato, Fabio, Trieste Univ., Italy; Quaia, Stefano, Trieste Univ., Italy; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 294-299; In English; Copyright; Avail: Issuing Activity

World-wide experience shows that one of the most concerning disturbances affecting power quality are the voltage sags whose major Source are tile short-circuits on the utility lines. Faults many kilometers from the disturbed process will generate a momentary voltage sag in the electrical environment to the end user. Independency on its magnitude and shape each voltage sag lasts as long, as the protection equipment allows fault current to flow. A reduction of the clearing time of the lines protection equipment may lead to a substantial power quality improvement because the majority of sensitive industrial processes (including

computer system power electronics and variable speed drives) are capable to ride through a sag of very limited duration typically below halt' period). This possibility exists with the modern technology One Such solution is analysed and discussed in the paper. Author

Mechanical Drives; Protection; Short Circuits; Electric Potential

20010021604 Solski Center Celje, Celje, Slovenia

Effects of Harmonics on Voltage Distortion and Losses in Wiring ***Vpliv Harmonikov na Popacenje Napetosti in Dodatne Izgube v Elektricnih Vodnikih***

Lilija, Bostjan, Solski Center Celje, Slovenia; Vorsic, Joze, Maribor Univ., Slovenia; Koritnik, Darko, Maribor Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 313-318; In Slovene; Copyright; Avail: Issuing Activity

Many loads in modern offices and industrial plants are nonlinear. A common source of harmonic currents in power systems is the electronic equipment that uses a rectifier supplying a d.c.-link with storage or ripple-smoothing capacitors. This type of electronic power supply is used either in factory adjustable-speed drives or in personal computers and home electronics. They create current and voltage distortion. In Slovenia, a.c. mains supply with a frequency of 50 Hz is used. Waveform distortion results from on addition of other frequencies which are multiples of the fundamental frequency. Nonlinear loads usually generate current distortion. Voltage distortion is created by the current flowing in supply and distribution impedances. Nonlinear loads have a very low power factor in terms of total watts/volt-amps. This means that there is more current flowing in the power system than required to have the job done. Harmonic currents cause power system heating and losses in wiring and transformer.
Author

Distortion; Electric Potential; Harmonics; Nonlinearity; Rectifiers; Ripples

20010021605 Electro Slovenia, Maribor, Slovenia

Conductor Heating Under Short-Circuit Conditions and Its Effects on Line Sagging ***Segrevanje Vodnikov v Kratkosticnih Pogojih z Vplivom na Povese pri Daljnovodih***

Jakl, Franc, Electro Slovenia, Slovenia; Zunec, Miro, Elektro Maribor, Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 306-312; In Slovene; Copyright; Avail: Issuing Activity

Conductors and ground wires of overhead transmission lines are exposed to a number of different stressing conditions. Apart from mechanical stressing, resulting mostly from various stressing in the winter period in the form of additional loads, there are also many other kinds of stressing. They originate in particular from conditions of normal and emergency operational states. Among the normal operational states there are states of important line loads (stationary states) and instantaneous loads at short circuits (non-stationary states). Apart from conductors, the pertaining coupling equipment, too, is exposed to heating effects. For such equipment, special criteria, in terms of mechanical and thermal stressing, should be seriously observed. Recently, there has been an increased interest noted in optic cables of various technological designs, such as for instance OPGW cables etc.. In Slovenia, too, they have been quite frequently used on high voltage overhead transmission lines where there are occurrences experienced of changes in physical properties of optical cables originating from increased temperatures. In such states, the initial temperature state of the conductor or of the OPGW cable in the moment of the short-circuit occurrence (initial temperature) is of a major importance, A critical state may take place when the line, this in particular applies to the summer season, is under a heavy-duty regime and when an extraordinary operational event is superimposed (short circuit). The resulting increased sags, i.e. reduced safety heights, have a negative effect on the operational reliability of the overhead transmission line or the overall electric power system. This is the reason why, in addition to normal operational states, the behaviour of the installed equipment operating under nonstationary states (short circuit) must be duly taken into regard in order to meet the newly adopted more rigorous operational criteria. For this purpose, the consequential changes, evoked by heating, in the conductor mechanical properties and increased sagging must in particular be paid utmost attention. When determining overtemperatures, attained by the conductor at the occurrence of short circuit, the temperature difference between the initial state (initial temperature) and the post short-circuit state is determined. The international IEC 949 standard takes into consideration the conductor nonadiabatic state (the dynamic model); it takes into account the heat outlet at the time of the short-circuit occurrence. This approach is quite useful especially for high current densities and short circuits of long duration (for instance 350 ms less than or = t(sub sc) less than or = 1000 ms). This corresponds to the second or third class of the distance protection. For lower short-circuit currents and shorter short-circuit duration (for instance 100 ms less than or = t(sub sc) less than or = 350 ms) corresponding to the first or second class of the distance protection, the adiabatic approach has proven itself to be more appropriate, Hereby, it is assumed that all the generated conductor heat is employed for the temperature rise with no consideration of the heat outlet during the heating process at the short-circuit occurrence. The international Study work group, OGRE WG 22.12 (Electrical Aspects of Overhead Lines) has been for several years engaged in the relevant research whose aim was determination of the calculation accuracy of overtemperatures contracted under short-circuit conditions at a particular short-circuit current and particular short-circuit duration. The main target of this

research was implementation of a simple and sufficiently accurate and practically employable methodology. Four methods were developed A, Be C and D.
Author
Conductors; Current Density; Dynamic Models; Heating; High Current; High Voltages; Mechanical Properties; Nonadiabatic Conditions; Temperature Effects; Transmission Lines

34
FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics.

20010019901 NASA Ames Research Center, Moffett Field, CA USA
Direct Measurement of the Supernova Rate in Starburst Galaxies
Bregman, J. D., NASA Ames Research Center, USA; Temi, P., NASA Ames Research Center, USA; Rank, D., California Univ., USA; Astronomy and Astrophysics; 2000; Volume 355, pp. 2000; In English; Copyright; Avail: Issuing Activity

Supernovae play a key role in the dynamics, structure, and chemical evolution of galaxies. The massive stars that end their lives as supernovae live for short enough times that many are still associated with dusty star formation regions when they explode, making them difficult to observe at visible wavelengths. In active star forming regions (galactic nuclei and starburst regions), dust extinction is especially severe. Thus, determining the supernova rate in active star forming regions of galaxies, where the supernova rate can be one or two orders of magnitude higher than the average, has proven to be difficult. From observations of SN1987A, we know that the [NiII] 6.63 micrometer emission line was the strongest line in the infrared spectrum for a period of a year and half after th explosion. Since dust extinction is much less at 6.63 micrometers than at visible wavelengths (A(sub 6.63)/A(sub V) = 0.025), the [NiII] line can be used as a sensitive probe for the detection of recent supernovae. We have observed a sample of starburst galaxies at 6.63 micrometers using ISOCAM to search for the [NiII] emission line characteristic of recent supernovae. We did not detect any [NiII] line emission brighter than a 5-sigma limit of 5 mJy. We can set upper limits to the supernova rate in our sample, scaled ot the rate in M82, of less than 0.3 per year at the 90% confidence level using Bayesian methods. Assuming that a supernova would have a [NiII] line with the same luminosity as observed in SN1987A, we find less than 0.09 and 0.15 per year at the 50% and 67% confidence levels. These rates are somewhat less if a more normal type II supernovae has a [NiII] line luminosity greater than the line in SN1987A.
Author
Supernovae; Starburst Galaxies; Emission

20010019997 Universities Space Research Association, USA
Three-Dimensional Stereoscopic Tracking Velocimetry and Experimental/Numerical Comparison of Directional Solidification
Lee, David, Illinois Univ., USA; Ge, Yi, Illinois Univ., USA; Cha, Soyoung Stephen, Illinois Univ., USA; Ramachandran, Narayanan, Universities Space Research Association, USA; [2001]; 1p; In English; 2nd; Pan Pacific Workshop on Microgravity Sciences, 1 May 2001, Pasadena, CA, USA
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

Measurement of three-dimensional (3-D) three-component velocity fields is of great importance in both ground and space experiments for understanding materials processing and fluid physics. The experiments in these fields most likely inhibit the application of conventional planar probes for observing 3-D phenomena. Here, we present the investigation results of stereoscopic tracking velocimetry (STV) for measuring 3-D velocity fields, which include diagnostic technology development, experimental velocity measurement, and comparison with analytical and numerical computation. STV is advantageous in system simplicity for building compact hardware and in software efficiency for continual near-real-time monitoring. It has great freedom in illuminating and observing volumetric fields from arbitrary directions. STV is based on stereoscopic observation of particles-Seeded in a flow by CCD sensors. In the approach, part of the individual particle images that provide data points is likely to be lost or cause errors when their images overlap and crisscross each other especially under a high particle density. In order to maximize the valid recovery of data points, neural networks are implemented for these two important processes. For the step of particle overlap decomposition, the back propagation neural network is utilized because of its ability in pattern recognition with pertinent particle image feature parameters. For the step of particle tracking, the Hopfield neural network is employed to find appropriate particle tracks based on global optimization. Our investigation indicates that the neural networks are very efficient and useful for stereoscopically tracking particles. As an initial assessment of the diagnostic technology performance, laminar water jets with and

without pulsation are measured. The jet tip velocity profiles are in good agreement with analytical predictions. Finally, for testing in material processing applications, a simple directional solidification apparatus is built for experimenting with a metal analog of succinonitrile. Its 3-D velocity field at the liquid phase is then measured to be compared with those from numerical computation. Our theoretical, numerical, and experimental investigations have proven STV to be a viable candidate for reliably measuring 3-D flow velocities. With current activities are focused on further improving the processing efficiency, overall accuracy, and automation, the eventual efforts of broad experimental applications and concurrent numerical modeling validation will be vital to many areas in fluid flow and materials processing.
Author
Directional Solidification (Crystals); Flow Velocity; Neural Nets; Velocity Measurement; Experimentation

20010020024 NASA Marshall Space Flight Center, Huntsville, AL USA
Experiment/Analytical Characterization of the RBCC Rocket-Ejector Mode
Ruf, J. H., NASA Marshall Space Flight Center, USA; Lehman, M., Pennsylvania State Univ., USA; Pal, S., Pennsylvania State Univ., USA; Santoro, R. J., Pennsylvania State Univ., USA; West, J., NASA Marshall Space Flight Center, USA; [2000]; 9p; In English; JANNAF - Interagency Propulsion Committee Joint Meeting, 13-17 Nov. 2000, Monterey, CA, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS8-40890; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Experimental and complementary CFD results from the study of the rocket-ejector mode of a Rocket Based Combined Cycle (RBCC) engine are presented and discussed. The experiments involved systematic flowfield measurements in a two-dimensional, variable geometry rocket-ejector system. The rocket-ejector system utilizes a single two-dimensional, gaseous oxygen/gaseous hydrogen rocket as the ejector. to gain a thorough understanding of the rocket-ejector's internal fluid mechanic/combustion phenomena, experiments were conducted with both direct-connect and sea-level static configurations for a range of rocket operating conditions. Overall system performance was obtained through global measurements of wall static pressure profiles, heat flux profiles and engine thrust, whereas detailed mixing and combustion information was obtained through Raman spectroscopy measurements of major species (oxygen, hydrogen, nitrogen and water vapor). The experimental results for both the direct-connect and sea-level static configurations are compared with CFD predictions of the flowfield.
Author
Computational Fluid Dynamics; Ejectors; Rocket-Based Combined-Cycle Engines; Spacecraft Propulsion

20010020146 Georgia Inst. of Tech., School of Aerospace Engineering, Atlanta, GA USA
Tunable Solid-State Laser and High Resolution Digital Cameras for Lagrangian Vortex Imaging ***Final Report, 1 Mar. 1999-30 Sep. 2000***
Komerath, N. M., Georgia Inst. of Tech., USA; Wong, O. D., Georgia Inst. of Tech., USA; Mahalingam, R., Georgia Inst. of Tech., USA; Dec. 31, 2000; 43p; In English
Contract(s)/Grant(s): DAAD19-99-1-0054
Report No.(s): AD-A385774; ARO-39278.1-EG-RIP; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This grant was for the purchase of a laser system and digital cameras. A Coherent Infinity XPO laser system has been acquired and installed at the Georgia Tech Low Speed Wind Tunnel as planned. A Roper Scientific ES 1.0 dual frame digital camera has been acquired to capture short-time-scale changes. and a Silicon Mountain Designs 6M3P digital camera was acquired to perform high-resolution imaging. Experiments to capture details of rotorcraft tip vortices using this system are proceeding as planned. to perform phosphorescence imaging, various food-grade phosphorescent materials have been selected and tested to capture time-scales of phosphorescence decay; these tests are continuing. Fiber-optic coupling of the beams from this laser was pursued. and fibers were successfully coupled to the beams for low power settings. This approach was temporarily abandoned in favor of an articulated mirror-tube system to enable operation with higher power levels and lower fiber attrition.
DTIC
Solid State Lasers; Digital Cameras; Vortices; High Resolution; Imaging Techniques; Tunable Lasers

20010020207 NASA Marshall Space Flight Center, Huntsville, AL USA
Transition of a Three-Dimensional Unsteady Viscous Flow Analysis from a Research Environment to the Design Environment
Dorney, Suzanne, NASA Marshall Space Flight Center, USA; Dorney, Daniel J., NASA Marshall Space Flight Center, USA; Huber, Frank, Riverbend Design Services, USA; Sheffler, David A., Agilis Group, USA; [2001]; 12p; In English; 39th; Aerospace Sciences, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NRA8-21
Report No.(s): AIAA Paper 2001-0080; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The advent of advanced computer architectures and parallel computing have led to a revolutionary change in the design process for turbomachinery components. Two- and three-dimensional steady-state computational flow procedures are now routinely used in the early stages of design. Unsteady flow analyses, however, are just beginning to be incorporated into design systems. This paper outlines the transition of a three-dimensional unsteady viscous flow analysis from the research environment into the design environment. The test case used to demonstrate the analysis is the full turbine system (high-pressure turbine, inter-turbine duct and low-pressure turbine) from an advanced turboprop engine.
Author
Dimensional Analysis; Three Dimensional Flow; Unsteady Flow; Viscous Flow

20010020211 Institute of Theoretical and Applied Mechanics, Novosibirsk, Russia
Aspects of the Interaction of Compression Shock Waves with Turbulent Boundary Layer in Conditions of Trans- and Supersonic Velocities
Zheltovodov, A. A., Institute of Theoretical and Applied Mechanics, Russia; Dvorzhank, R., Institute of Theoretical and Applied Mechanics, Russia; Shafarzhik, P., Institute of Theoretical and Applied Mechanics, Russia; Izvestiya Sibirskogo Otdelenii Akademii Nauk SSSR Seriya Tekhnicheskikh Nauk; 1990, No. 6, pp. 31-42; In English; Translated into English by Leo Kanner Associates, Redwood City, CA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The necessity of predicting the characteristics of trans- and supersonic flows in the zones of compression shock wave interaction with a turbulent boundary layer occurs in solving a wide class of problems in interior and exterior aerodynamics. The possibility of boundary layer detachment occurring under these conditions can substantially affect the performance of turbomachines, aircraft control surfaces, and other devices. Advances in modern calculation models are significantly associated with the need for experimental studies. Accordingly, among the urgent problem must be included the refinement of conditions under which detached flows originate and progress. In particular, this applies to cases of three-dimensional interactions; the concepts of their properties are the most contradictory. In view of the fundamental difference in the formation conditions and in the existing criteria for detachment originating in zones of two-dimensional and three-dimensional interaction, the analogues of some of their properties noted in several studies are in need of further refinement. Out of the great diversity of situations in which one can expect three-dimensional detachment to occur we can single out flows with direct compression shock waves--which have been studied by the authors, for example, in the vicinity of a vertical fin mounted on a flat surface. This case is the most common compared to the two-dimensional direct compression shock wave owing to the effect of the flow component along the perturbation front. An analysis and comparison of aspects of the buildup of detachment in these situations is the subject of the present study, which was carried out as part of a program of scientific cooperation between the Institute of Thermomechanics of the Czechoslovak Academy of Sciences (Prague, Czechoslovakia) and the Institute of Theoretical and Applied Mechanics of the Siberian Division of the USSR Academy of Sciences (Novosibirsk, USSR).
Derived from text
Shock Wave Interaction; Compression Waves; Turbulent Boundary Layer; Transonic Flow; Supersonic Flow; Flow Velocity; Flow Distribution

20010020213 Office National d'Etudes et de Recherches Aerospatiales, Chatillon, France
Physics of Turbulent Flows *Physique des Ecoulements Tourbillonnaires*
Delery, J., Office National d'Etudes et de Recherches Aerospatiales, France; [1990]; 9p; In English; The Aerodynamics of the Turbulent Flows, 1-4 Oct. 1990, Scheveningen, Netherlands; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Three-dimensional flow, separation leads to the formation of swirling structures formed by rolling up of the "sheet" of viscous fluid which, hitherto stuck to the wall in a thin layer, emerges abruptly within the non dissipative external flow. The physical comprehension of this phenomenon must rest on a rational analysis of the field calling upon the theory of the critical points. One can thus give a correct interpretation of spectra the parietal, true impressions of the external field, and describe with precision the organization of swirling rollings up. This step is applied to separations generated to bodies of typical form whose field was carefully studied starting from visualizations and of explorations by probes multi-holes and velocimetry laser. The problem of the swirling bursting, if significant in many applications, are discussed in a faster way, the subject deserving with him only a whole communication.
Author
Aerodynamics; Turbulent Flow; Flow Characteristics

20010020310 California Univ., Dept. of Mathematics, Los Angeles, CA USA

Hierarchical Modeling and Simulation Techniques with Application to Computational Fluid Dynamics and Fluid-Flow Control ***Final Report, 1 Aug. 1996-31 Jul. 1999***

Anderson, C. R.; Gibson, J. S.; Dec. 06, 2000; 8p; In English

Contract(s)/Grant(s): F49620-96-C-0327

Report No.(s): AD-A385539; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The primary research objective of this contract was to investigate and develop fluid flow control procedures by utilizing a hierarchical modeling approach. This project included research on control and identification methods for vortex wakes, with the primary example being stabilization of vortices behind a flat plate. Vortex blob and finite difference methods were constructed to provide the flow dynamics. Linear time-invariant feedback controllers have been developed, as well as identification results for a class of input/output models that can be used to design more sophisticated controllers. Additionally, Java based software components that support hierarchical modeling efforts were created.

DTIC

Hierarchies; Simulation; Computational Fluid Dynamics; Fluid Flow; Control Theory; Vortices; Wakes

20010020358 Ohio State Univ., Dept. of Mechanical Engineering, Columbus, OH USA

Development and Application of Advanced Optical Diagnostics for the Study of High Speed Flows in Micro Systems ***Final Report***

Lempert, Walter R.; Samimy, Mo; Subramaniam, Vish; Dec. 21, 2000; 11p; In English

Contract(s)/Grant(s): F49620-00-1-0169

Report No.(s): AD-A385775; AFRL-SR-BL-TR-01-0013; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A program has been initiated to develop and demonstrate the applicability of time-of-flight and Doppler-based optical velocimetry techniques to supersonic micro scale flow fields. In particular, Molecular Tagging Velocimetry (MTV) measurements have been performed, using acetone vapor as a molecular tracer, in the flow produced by a 1 mm diameter, pressure matched, sonic nozzle. Measurements were performed over a static pressure range from approximately equal 1 torr to approximately equal 20 torr. Measurement accuracy is found to be on the order of 5 m/sec at a spatial resolution of order 10 microns. As a compliment to the experimental measurements, a computational program was also initiated which focused on the development of in house Navier - Stokes and Direct Simulation Monte Carlo (DSMC) codes.

DTIC

Supersonic Nozzles; Supersonic Flow; Microelectromechanical Systems; Computerized Simulation; Diagnosis; Molecular Flow; Velocity Measurement

20010020422 Naval Postgraduate School, Monterey, CA USA

Applications of Arbitrary Lagrangian Eulerian (ALE) Analysis Approach to Underwater and Air Explosion Problems

Trevino, Theodore, Naval Postgraduate School, USA; September 2000; 202p; In English

Report No.(s): AD-A384983; No Copyright; Avail: CASI; A03, Microfiche; A10, Hardcopy

A series of underwater and air explosion investigations was conducted using the Arbitrary Lagrangian-Eulerian (ALE) numerical technique. The investigation primarily examined the explosive-fluid, fluid-structure, and fluid-air interaction effects, and the shock wave pressure propagation through a subjected medium, with the intent of verifying and validating the ALE analysis. The research also noted the explosive-air and air-structure interaction effects as well as shock wave pressure propagation effects. Three-dimensional underwater explosion analyses were conducted using TNT detonation. Two-dimensional air explosion analyses were completed using TNT detonations. With viable ALE results, underwater and air explosion modeling and simulation could become dependable, cost-effective, and time-efficient.

Author

Euler-Lagrange Equation; Aerial Explosions; Pressure Effects; Shock Wave Propagation; Simulation; Underwater Explosions

20010020434 Maryland Univ., Dept. of Mechanical Engineering, College Park, MD USA

Subcooled Pool Boiling Heat Transfer Mechanisms in Microgravity: Terrier-Improved Orion Sounding Rocket Experiment ***Final Report***

Kim, Jungho, Maryland Univ., USA; Benton, John, Maryland Univ., USA; Kucner, Robert, Maryland Univ., USA; December 2000; 20p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG3-2228; RTOP 101-53-00

Report No.(s): NASA/CR-2000-210570; NAS 1.26:210570; E-12536; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A microscale heater array was used to study boiling in earth gravity and microgravity. The heater array consisted of 96 serpentine heaters on a quartz substrate. Each heater was 0.27 square millimeters. Electronic feedback loops kept each heater's temperature at a specified value. The University of Maryland constructed an experiment for the Terrier-Improved Orion sounding rocket that was delivered to NASA Wallops and flown. About 200 s of high quality microgravity and heat transfer data were obtained. The VCR malfunctioned, and no video was acquired. Subsequently, the test package was redesigned to fly on the KC-135 to obtain both data and video. The pressure was held at atmospheric pressure and the bulk temperature was about 20 C. The wall temperature was varied from 85 to 65 C. Results show that gravity has little effect on boiling heat transfer at wall superheats below 25 C, despite vast differences in bubble behavior between gravity levels. In microgravity, a large primary bubble was surrounded by smaller bubbles, which eventually merged with the primary bubble. This bubble was formed by smaller bubbles coalescing, but had a constant size for a given superheat, indicating a balance between evaporation at the base and condensation on the cap. Most of the heaters under the bubble indicated low heat transfer, suggesting dryout at those heaters. High heat transfer occurred at the contact line surrounding the primary bubble. Marangoni convection formed a "jet" of fluid into the bulk fluid that forced the bubble onto the heater.
Author
Nucleate Boiling; Microgravity; Heat Transfer; Sounding Rockets; Heating Equipment

20010020436 NASA Langley Research Center, Hampton, VA USA
CFD Validation Studies for Hypersonic Flow Prediction
Gnoffo, Peter A., NASA Langley Research Center, USA; [2001]; 16p; In English; 39th; Aerospace Sciences, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2000-1025; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of experiments to measure pressure and heating for code validation involving hypersonic, laminar, separated flows was conducted at the Calspan-University at Buffalo Research Center (CUBRC) in the Large Energy National Shock (LENS) tunnel. The experimental data serves as a focus for a code validation session but are not available to the authors until the conclusion of this session. The first set of experiments considered here involve Mach 9.5 and Mach 11.3 N2 flow over a hollow cylinder-flare with 30 degree flare angle at several Reynolds numbers sustaining laminar, separated flow. Truncated and extended flare configurations are considered. The second set of experiments, at similar conditions, involves flow over a sharp, double cone with forecone angle of 25 degrees and aft-cone angle of 55 degrees. Both sets of experiments involve 30 degree compressions. Location of the separation point in the numerical simulation is extremely sensitive to the level of grid refinement in the numerical predictions. The numerical simulations also show a significant influence of Reynolds number on extent of separation. Flow unsteadiness was easily introduced into the double cone simulations using aggressive relaxation parameters that normally promote convergence.
Author
Computational Fluid Dynamics; Hypersonic Flow; Hypersonic Speed; Numerical Analysis; Shock Tunnels; Computerized Simulation; Aerothermodynamics

20010020623
Supersonic flow. Pt. 5 Shock waves
Sanna, G.; Tomassetti, G.; Feb. 28, 1998; 48p; In Italian; In English
Report No.(s): DE99-712618; ENEA-RT-INN-97-31; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The discontinuities in the flow fields (both tangential and shocks) are considered and the equations for the quantities conserved across them are written. The post-shock flow variables are expressed by the Mach number of the incident supersonic flow and its deflection angle operated by rigid wall. Normal and oblique shocks are considered and graphs and polar diagrams are introduced. Then the reflections of a shock wave operated by a rigid wall and by the boundary between a jet and a stagnating gas are analyzed. Finally, the interactions between two distinct shock waves are considered.
NTIS
Supersonic Flow; Shock Waves

20010020625
Empirical study of vertical pneumatic conveying
Rautiainen, A.; Poikolainen, V.; Stewart, G.; Sarkomaa, P.; Dec. 31, 1998; 57p; In English
Report No.(s): DE99-706800; LTKK-EN-A42; ISBN 951-764-229-6; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A comprehensive description of vertical gas/solid two-phase flow using an elementary equation system and experimental techniques is presented. The equation system was derived from first principles and is presented in its entirety. The results from non-accelerating flow experiments conducted using a riser tube of bore 192 mm and height 16.2 m using spherical glass beads of average diameter 64 (mu)m are presented graphically. These include, among others, results for total pressure drop, solids volume fraction, solids friction factor and particle slip velocity. Several instances of highly negative friction factors have been calculated. These were due to the internal recirculation of the solids at low superficial gas velocities. Under these conditions the flow of the suspension was often very spatially and temporally heterogeneous compared to the homogeneous flow field observed at high superficial gas velocities. All the presented results agree well qualitatively with those found in literature.
NTIS
Pneumatics; Two Phase Flow

20010020647
Visco-elastic spectra of a dilute Bose fluid
Minguzzi, A.; Tosi, M. P.; Sep. 30, 1998; 14p; In English
Report No.(s): DE99-607929; IC-98/129; No Copyright; Avail: Department of Energy Information Bridge

A recently developed local-density current functional formalism for confined Bose-condensed superfluids requires visco-elastic spectra which are defined through a finite-frequency extension of the dissipative coefficients entering the linearized hydrodynamic equations of the two-fluid model. We evaluate these spectra for a superfluid with contact interactions in the collisionless regime at finite temperature, by working to first order beyond the Bogolubov approximation. We find that within this approximation all the visco-elastic spectra take the same value apart from simple multiplicative factors.
NTIS
Spectra; Bose-Einstein Condensates

20010020662 NASA Marshall Space Flight Center, Huntsville, AL USA
Convective Flow Induced by Localized Traveling Magnetic Fields
Mazuruk, Konstantin, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English, 23 Jun. 2001, Palm Cove, Australia; Sponsored by International Centre for Heat and Mass Transfer, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

An axisymmetric traveling magnetic field induces a meridional base flow in a cylindrical zone of an electrically conducting liquid. This remotely induced flow can be conveniently controlled, in magnitude and direction, and can have benefits for crystal growth applications. In particular, it can be used to offset natural convection. For long vertical cylinders, non-uniform and localized in the propagating direction, magnetic fields are required for this purpose. Here we investigate a particular form of this field, namely that induced by a set of a few electric current coils. An order of magnitude reduction of buoyancy convection is theoretically demonstrated for a vertical Bridgman crystal growth configuration.
Author
Convection; Convective Flow; Magnetic Fields

20010020954 NASA, Washington, DC USA
General Study of Gas Flow Through any Tube and Passing Through the Speed of Sound (Under Steady State Conditions or any Other Condition With Heat Addition and Possibly Chemical Reactions) ***Etude Generale de l'Ecoulement d'un gaz a Travers une Tuyere Quelconque et du Passage par la Vitesse du son (en Regime Permanent ou Quelconque avec Apport de Chaleur et Reaction Chimique Eventuels)***
Serruys, Max, National Museum and Coll. of Higher Technology for Training Students in the Application of Science to Industry; Publications Scientifiques et Techniques du Ministere de l'Air; February 1993, No. 272; 66p; In English
Report No.(s): NASA-TT-21010; NAS 1.77:21010; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The flow of an elastic fluid in a tube, under steady state or variable state conditions, with or without heat addition, and with or without changes in chemical composition, constitutes a phenomenon whose practical applications (gas turbines, reaction propulsion systems, etc.) are important or soon will be, and which for this reason has been the subject of numerous theoretical studies from the time of Laval and Hugoniot until the present time (however, generally limited to simple special cases). As we will see, the present report, which is the outcome of this study, permits us not only to establish by very simple means a differential equation whose interpretation completely explains what occurs at the moment of the passage through the speed of sound, but to define all the modes of fluid flow in the general case and in the principal special cases, as well as the influence of the different factors themselves on this flow: shape of the tube, chemical reactions, addition of exterior heat, etc.
Derived from text
Gas Flow; Pipes (Tubes); Acoustic Velocity; Chemical Reactions; Fluid Flow; Thermodynamics; Differential Equations

20010020955 Office National d'Etudes et de Recherches Aerospatiales, Chatillon, France

Physics of Vortex Flows ***Physique des Ecoulements Tourbillonnaires***

Delery, J., Office National d'Etudes et de Recherches Aerospatiales, France; [1990]; 83p; In English; Aerodynamics of Vortex Flows, 1-4 Oct. 1990, Scheveningen, Netherlands; Sponsored by Advisory Group for Aerospace Research and Development, France; Translated into English by Leo Kanner Associates; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In a three-dimensional flow, separation leads to the formation of vortex structures formed by the rolling up of the "sheet" of viscous fluid which until that point had adhered to the wall in a thin layer, but now abruptly springs away into the non-dissipative outer flow. A physical understanding of this phenomenon must be based on a rational analysis of the field, using critical-points theory. In this way one can provide a correct interpretation of peripheral spectra, which are true imprints of the outer field, and describe precisely the organization of vortex flows. This procedure is applied to separations produced on a body of typical shape, whose field has been carefully studied via visualizations and explorations with multi-hole probes and laser velocimetry. The problem of vortex breakdown, which is so important in many applications, is discussed more cursorily, since the subject is worthy of a paper of its own.

Author

Conferences; Vortices; Three Dimensional Flow; Separated Flow

20010020962

System of three vortices of two-dimensional ideal hydrodynamics as a new example of the (integrable) Nambu-Poisson mechanics

Makhaldiani, N.; Dec. 31, 1998; 7p; In English

Report No.(s): DE99-602105; JINR-E-2-97-407; No Copyright; Avail: Department of Energy Information Bridge

A Nambu-Poisson formulation of the system of three ordinary differential equations, describing the dynamics of three vortices of the ideal two-dimensional hydrodynamics, is given. The system is integrated by quadratures.

NTIS

Vortices; Hydrodynamics

20010021095

Workshop 'Measurement technology for steady state and transient multi phase flows'

Prasser, H. M.; Dec. 31, 1997; 130p; In German; In English; German. Workshop on measuring technology for steady and transient multiphase flows

Report No.(s): DE99-705938; FZR-204; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

There is hardly another area of physics which has a comparable multiplicity of phenomena, like flow in multi-phase mixtures. The wishes of experimenters regarding measurement technique are correspondingly great: Apart from the conventional parameters of pressure, temperature and speed of flow, as great a collection with resolution of the instantaneous phase distribution is required. Also, the phases themselves frequently consists of several components, whose concentration should also be measured. The enormous progress which has recently been made with laser optics and tomographic processes, must be compared with a long list of unsolved problems, above all where non-contact measurement is concerned. The attempts at solutions are multivarious, the need for the exchange of experience is great and the comparison of measurement processes with one another must be strengthened. The workshop has set itself these targets.

NTIS

Conferences; Multiphase Flow; Equilibrium Flow; Steady Flow

20010021100

Newsletter on computational hydraulics and fluid dynamics

Dec. 31, 1997; 5p; In English

Report No.(s): DE98-775464; EDF-R-20-97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This newsletter from Electricite de France (EdF) laboratory of hydraulics and fluid dynamics, reports on recent computer simulation studies of fluid flow in the domain of energy. Five papers were selected which deal with: unsteady flows in turbine blades of turbo-machineries, thermal exchanges between fluid and structures, multi-fluid thermal interactions in heat exchangers, heat transfers through windows, and flows induced by dam breaking.

NTIS

Computational Fluid Dynamics; Fluid Flow

20010021325 Academy of Sciences (USSR), Novosibirsk, USSR

On the Procedure of the Measurement of Surface Friction by the Single-Ray Laser of Interferometron

Kornilov, V. I., Academy of Sciences (USSR), USSR; Mekler, D. K., Academy of Sciences (USSR), USSR; Pavlov, A. A., Academy of Sciences (USSR), USSR; Methods of Aerophysical Studies; [1981], pp. 144-151; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The existing methods of measuring surface friction in the turbulent shift flows (Prestoka, Klauzera and others), are based on the use of the law of similarity in the distribution of speeds. Therefore, during the study of the structure of flow in turbulent data measuring becomes problematic. As far as more precise methods, for example, of the floating element are concerned, strictly speaking, there is no point in the sense that recording the frictional force applied to the element is conducted on the surface of finite dimensions. All this requires the imperative need of developing of new and development of the existing methods of measuring surface friction.

Derived from text

Atmospheric Physics; Friction; Surface Properties; Friction Measurement

20010021392 Stanford Univ., Center for Turbulence Research, Stanford, CA USA

Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program

Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000; 366p; In English; Studying Turbulence Using Numerical Simulation Databases, 2-27 Jul. 2000, Stanford, CA, USA; See also 20010021393 through 20010021421; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The eighth Summer Program of the Center for Turbulence Research took place in the four-week period, July 2 to July 27, 2000. This was the largest CTR Summer Program to date, involving forty participants from the U. S. and nine other countries. Twenty-five Stanford and NASA-Ames staff members facilitated and contributed to most of the Summer projects. Several new topical groups were formed, which reflects a broadening of CTR's interests from conventional studies of turbulence to the use of turbulence analysis tools in applications such as optimization, nanofluidics, biology, astrophysical and geophysical flows. CTR's main role continues to be in providing a forum for the study of turbulence and other multi-scale phenomena for engineering analysis. The impact of the summer program in facilitating intellectual exchange among leading researchers in turbulence and closely related flow physics fields is clearly reflected in the proceedings.

Derived from text

Large Eddy Simulation; Turbulence Models; Turbulent Flow; Mathematical Models; Vortices; Computerized Simulation

20010021394 California Univ., Dept. of Mechanical and Aerospace Engineering, Los Angeles, CA USA

Atomistic Simulation of Electro-Osmosis in a Nanometer-Scale Channel

Freund, J. B., California Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 21-29; In English; See also 20010021392; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

An atomistic simulation of an electro-osmostic flow in a 50A wide channel is performed to examine models for such flows and study its physical details. The working fluid considered is a 1.1M mean concentration solution of Cl(-) in water. For simplicity and computational efficiency, only negatively charged ions are in the solution. The water is modeled by the SPC/E potential, and the Cl(-) are modeled as point charges plus an established Lennard-Jones potential. The channel walls are fixed lattices of positively charged Lennard-Jones atoms. An aperiodic implementation of the P(sup 3)M algorithm is used to compute electrostatic interactions. The distribution of Cl(-) adjacent to the charged walls differs somewhat from theoretical predictions that assume infinitesimal ions and constant electric permittivity, and this second assumption is called into question because it is found that the waters near the wall are preferentially oriented by the local electric field, which will alter their dielectric properties. When an electric field is applied parallel to the channel walls, a velocity profile develops that is consistent with a monolayer thick Stern layer fixed to the channel walls.

Author

Channel Flow; Electrostatics; Lennard-Jones Potential; Computerized Simulation; Ion Distribution

20010021396 Montpellier Univ., France

Design of Minimal Dispersion Fluidic Channels in a CAD-Free Framework

Mohammadi, B., Montpellier Univ., France; Molho, J. I., Stanford Univ., USA; Santiago, J. G., Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 49-62; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

We show the application of our shape optimization approach to the design of electroosmotic micro-fluidic channels realizing minimal geometrical dispersion on 90- and 180-degree turns.
Author
Optimization; Channel Flow; Parameterization; Fluidics

20010021401 Technische Hogeschool, Lab. for Aero- and Hydrodynamics, Delft, Netherlands
Particle Distributions in the Flow Over a Wavy Wall
Boersma, Bendiks Jan, Technische Hogeschool, Netherlands; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 109-117; In English; See also 20010021392; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

In this paper we will present the results of direct numerical simulation (DNS) of the flow over a small amplitude wavy wall. The evolution in space and time of particles are released in this flow will be examined. It will be shown that small waves on the channel bottom can generate large longitudinal vortices similar to Langmuir vortices that are observed in flows with waves at the free-surface. The simulation results show that the concentration of the particles is maximal on the downstream side of the wave crest.
Author
Direct Numerical Simulation; Particle Motion; Channel Flow; Particles

20010021405 Stanford Univ., Center for Turbulence Research, Stanford, CA USA
Toward a Unified High-Pressure Drop Model for Spray Simulations
Oefelein, J. C., Stanford Univ., USA; Aggarwal, S. K., Illinois Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 193-205; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This research focuses on the development of a unified drop vaporization model for use in simulations of high-pressure spray combustion processes. Emphasis is placed on the analysis of supercritical and transcritical processes. These processes occur when a liquid drop that is initially at a subcritical temperature is injected into a high-pressure gaseous environment that exceeds the thermodynamic critical pressure of the interfacial mixture. For this situation the gas-liquid interface undergoes what is commonly referred to as a transcritical heating process. This process is dominated by thermodynamic nonidealities and transport anomalies. Classical models derived using the quasi-steady approximation fail in this limit because of the fundamental assumption that drop vaporization rates are dominated by quasi-steady convective processes. In the transcritical limit, drop vaporization rates are dominated by unsteady diffusion processes. These rate-limiting modes represent two extremes. Here we investigate these extremes by presenting the results from a series of direct numerical simulations. Emphasis is placed on the existence of two rate-limiting parameters and on obtaining a unified approach for modeling the transitional behavior of vaporizing drops over a range of pressures from atmospheric to supercritical.
Author
Combustion Physics; Drops (Liquids); Gas-Liquid Interactions; Supercritical Flow; Vaporizing; Direct Numerical Simulation

20010021407 United Technologies Research Center, East Hartford, CT USA
Evaluation of an Industrial CFD Code for LES Applications
Wang, Meng, Stanford Univ., USA; Choi, Dochul, United Technologies Research Center, USA; Prasad, Dilip, United Technologies Research Center, USA; Pierce, Charles, Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 221-228; In English; See also 20010021392; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The feasibility of using an industrial compressible CFD code for large eddy simulations (LES) is evaluated. Dynamic subgrid scale (SGS) models developed at CTR, have been implemented into the code and tested in a fully developed turbulent channel flow. In order to evaluate the effects of the SGS model compared with the numerical dissipation inherent in the upwind-biases schemes, computations without any SGS model were also carried out. It is found that the effect of dynamic SGS model decreases with increasing numerical dissipation (low order schemes). The 9th and 11th order schemes have relatively small numerical dissipation, and thus the dynamic SGS model plays a useful role. In addition, a wall model was implemented in conjunction with LES. Although the velocity profile obtained with the wall model agrees well with the full LES solution, the magnitude of the pressure fluctuation is found to be overpredicted.
Author
Computational Fluid Dynamics; Dynamic Models; Large Eddy Simulation; Applications Programs (Computers)

20010021408 Melbourne Univ., Australia

Evaluation of RANS Models for Rotating Flows

Iaccarino, G., Stanford Univ., USA; Ooi, A., Melbourne Univ., Australia; Petterson, B. A., Norwegian Defence Research Establishment, Norway; Durbin, P. A., Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 229-239; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Two- and three-dimensional simulations of the flow in rotating rib-roughened ducts are carried out using several turbulence closures. One and two-equation models have been used together with the four-equation v(exp 2) - f model. In addition, a modification of this model that systematically accounts for system rotation has been used. Results show that the v(exp 2) - f model is superior to the others in predicting wall heat transfer and, for the rotating case, the modified model accurately accounts for the effect of the system frame rotation.

Author

Turbulence Models; Ducted Flow; Fluid Flow; Vortices; Channel Flow; Computerized Simulation; Applications Programs (Computers)

20010021409 Norwegian Defence Research Establishment, Norway

On Stably Stratified Homogeneous Shear Flows Subjected to Rotation

Durbin, P. A., Stanford Univ., USA; Pettersson, B. A., Norwegian Defence Research Establishment, Norway; Ooi, A., Melbourne Univ., Australia; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 241-248; In English; See also 20010021392; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Theoretical aspects of modeling stratified turbulent flows subjected to rotation are considered. The structural equilibrium behavior of second-moment closure (SMC) models is explored, guided by bifurcation analysis. It is shown that the ability of the models to predict a critical gradient Richardson number in the absence of system rotation RI(sup cr)(sub g) approx. = .25 is largely dependent on the model for the pressure-strain correlation tensor. It is also found that the most commonly used linear models are ill-posed when the combined effect of system rotation and stratification is imposed; the models do not exhibit a steady state solution.

Author

Shear Flow; Stratification; Turbulent Flow; Rotation; Turbulence Models

20010021410 Waterloo Univ., Ontario Canada

LES and Unsteady RANS of Boundary-Layer Transition Induced by Periodically Passing Wakes

Wu, X., Stanford Univ., USA; Ham, F. E., Waterloo Univ., Canada; Lien, F. S., Waterloo Univ., Canada; Wang, M., Stanford Univ., USA; Durbin, P., Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 249-260; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Results from 3-dimensional large-eddy simulation (LES) and 2-dimensional unsteady Reynolds-averaged Navier-Stokes (RANS) simulation of a spatially-evolving flat-plate boundary-layer undergoing transition induced by periodically passing wakes are presented and compared. The LES simulations used a novel kinetic-energy conserving finite-volume discretization of the incompressible Navier-Stokes equations and the standard dynamic Smagorinsky subgrid-scale model. RANS simulations were based on the STREAM code of Lien & Leschziner with the v(exp 2) - f turbulence model of Lien & Durbin (1996). When compared to the direct numerical simulation (DNS) of Wu et al., the LES was able to correctly predict the onset of transition. Inspection of the instantaneous flow field in the transition region confirmed that intermittent turbulent spots were being distinctly resolved. A close inspection of the fluctuating velocities near the top of the boundary layer just prior to spot formation confirmed the presence of the ”backward jet” inflectional velocity profile proposed by Wu et al. and Jacobs & Durbin as the precursor to turbulent spot formation, suggesting that the LES is actually capturing the bypass transition mechanism, at least in these initial stages. The transition length predicted by LES, however, was consistently shorter than the DNS result. The unsteady RANS simulations were also able to correctly predict the onset of transition, in this case by the mechanism of turbulent diffusion from the turbulence kinetic energy of the passing wake into the boundary layer. The transition length predicted by RANS is also in agreement with the DNS; however, the overshoot of average skin friction relative to the flat plate correlation (seen in both the DNS and present LES) was not observed.

Author

Large Eddy Simulation; Reynolds Averaging; Navier-Stokes Equation; Boundary Layer Transition; Wakes; Turbulence Models

20010021411 NASA Ames Research Center, Moffett Field, CA USA

Time Filtering in Large Eddy Simulations

Carati, Daniele, Free Univ., Belgium; Wray, Alan A., NASA Ames Research Center, USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 263-270; In English; See also 20010021392; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

An explicit time filter is applied to the Navier-Stokes equation prior to a space filter. The time filter is supposed to be smooth, and an exact expansion depending on the time derivatives of the velocity is derived for the associated stress tensor. On the contrary, the effect of the space filter is treated as usual and an eddy viscosity model is introduced in the LES equation. The total stress is thus represented using a new class of mixed models combining time and space derivatives of the LES field.

Author

Navier-Stokes Equation; Large Eddy Simulation; Isotropic Turbulence; Filters; Spatial Filtering

20010021412 NASA Ames Research Center, Moffett Field, CA USA

Numerical Simulations of Homogeneous Turbulence Using Lagrangian-Averaged Navier-Stokes Equations

Mohseni, Kamran, California Inst. of Tech., USA; Shkoller, Steve, California Univ., USA; Kosovic, Branko, California Univ., USA; Marsden, Jerrold E., California Inst. of Tech., USA; Carati, Daniele, Free Univ., Belgium; Wray, Alan, NASA Ames Research Center, USA; Rogallo, Robert, NASA Ames Research Center, USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 271-283; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Lagrangian-averaged Navier-Stokes (LANS) equations are numerically evaluated as a turbulence closure. They are derived from a novel Lagrangian averaging procedure on the space of all volume-preserving maps and can be viewed as a numerical algorithm which removes the energy content from the small scales (smaller than some a priori fixed spatial scale alpha) using a dispersive rather than dissipative mechanism, thus maintaining the crucial features of the large scale flow. We examine the modeling capabilities of the LANS equations for decaying homogeneous turbulence, ascertain their ability to track the energy spectrum of fully resolved direct numerical simulations (DNS), compare the relative energy decay rates, and compare LANS with well-accepted large eddy simulation (LES) models.

Author

Navier-Stokes Equation; Homogeneous Turbulence; Large Eddy Simulation; Turbulence Models; Direct Numerical Simulation

20010021413 Commissariat a l'Energie Atomique, Service d'Astrophysique, Gif-sur-Yvette, France

Non-Locality of Scale Interactions in Turbulent Shear Flows

Hersant, F., Commissariat a l'Energie Atomique, France; Dubrulle, B., Commissariat a l'Energie Atomique, France; Wang, M.a, Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 285-291; In English; See also 20010021392; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The scale interactions in turbulent shear flow are evaluated using a channel flow DNS database at Re(sub tau) = 590. The velocity field is filtered using a sharp cut-off filter in the Fourier space, and the relative magnitudes of the advective terms in the small scale equations, derived from Navier-Stokes equations, are computed as a function of wavenumber. We show that the interactions at small scales are non-local in the direction of the mean flow, dominated by the advection of small scales by large scale vortices. This non-locality of interactions suggests that the subgrid-scale model of Dubrulle and Nazarenko (1997) for 2D turbulence is likely to be applicable to turbulent shear flows as well.

Author

Navier-Stokes Equation; Shear Flow; Turbulent Flow; Velocity Distribution; Scale Effect; Turbulence Models

20010021414 NASA Ames Research Center, Moffett Field, CA USA

Evaluation of the Use of Second Generation Wavelets in the Coherent Vortex Simulation Approach

Goldstein, D. E., Missouri Univ., USA; Vasilyev, O. V., Missouri Univ., USA; Wray, A. A., NASA Ames Research Center, USA; Rogallo, R. S., NASA Ames Research Center, USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 293-304; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The objective of this study is to investigate the use of the second generation bi-orthogonal wavelet transform for the field decomposition in the Coherent Vortex Simulation of turbulent flows. The performances of the bi-orthogonal second generation wavelet transform and the orthogonal wavelet transform using Daubechies wavelets with the same number of vanishing moments are compared in a priori tests using a spectral direct numerical simulation (DNS) database of isotropic turbulence fields: 256(exp 3) and 512(exp 3) DNS of forced homogeneous turbulence (Re(sub lambda) = 168) and 256(exp 3) and 512(exp 3) DNS of decay-

ing homogeneous turbulence (Re(sub lambda) = 55). It is found that bi-orthogonal second generation wavelets can be used for coherent vortex extraction. The results of a priori tests indicate that second generation wavelets have better compression and the residual field is closer to Gaussian. However, it was found that the use of second generation wavelets results in an integral length scale for the incoherent part that is larger than that derived from orthogonal wavelets. A way of dealing with this difficulty is suggested.
Author
Homogeneous Turbulence; Isotropic Turbulence; Turbulent Flow; Wavelet Analysis

20010021415 NASA Ames Research Center, Moffett Field, CA USA
CVS Decomposition of 3D Homogeneous Turbulence Using Orthogonal Wavelets
Farge, Marie, Ecole Normale Superieure, France; Schneider, Kai, Provence Univ., France; Pellegrino, Giulio, Karlsruhe Univ., Germany; Wray, A. A., NASA Ames Research Center, USA; Rogallo, R. S., NASA Ames Research Center, USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 305-317; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper compares the filtering used in Coherent Vortex Simulation (CVS) decomposition with an orthogonal wavelet basis, with the Proper Orthogonal Decomposition (POD) or Fourier filtering. Both methods are applied to a field of Direct Numerical Simulation (DNS) data of 3D forced homogeneous isotropic turbulence at microscale Reynolds number R(sub lambda) = 168. We show that, with only 3%N retained modes, CVS filtering separates the coherent vortex tubes from the incoherent background flow. The latter is structureless, has an equipartition energy spectrum, and has a Gaussian velocity probability distribution function (PDF) and an exponential vorticity PDF. On the other hand, the Fourier basis does not extract the coherent vortex tubes cleanly and leaves organized structures in the residual high wavenumber modes whose PDFs are stretched exponentials for both the velocity and the vorticity.
Author
Decomposition; Homogeneous Turbulence; Nonlinear Filters; Wavelet Analysis; Vortices; Orthogonal Functions

20010021416 NASA Ames Research Center, Moffett Field, CA USA
CVS Filtering of 3D Turbulent Mixing Layers Using Orthogonal Wavelets
Schneider, Kai, Provence Univ., France; Farge, Marie, Ecole Normale Superieure, France; Pellegrino, Giulio, Karlsruhe Univ., Germany; Rogers, Michael, NASA Ames Research Center, USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 319-330; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Coherent Vortex Simulation (CVS) filtering has been applied to Direct Numerical Simulation (DNS) data of forced and unforced time-developing turbulent mixing layers. CVS filtering splits the turbulent flow into two orthogonal parts, one corresponding to coherent vortices and the other to incoherent background flow. We have shown that the coherent vortices can be represented by few wavelet modes and that these modes are sufficient to reproduce the vorticity probability distribution function (PDF) and the energy spectrum over the entire inertial range. The remaining incoherent background flow is homogeneous, has small amplitude, and is uncorrelated. These results are compared with those obtained for the same compression rate using large eddy simulation (LES) filtering. In contrast to the incoherent background flow of CVS filtering, the LES subgrid scales have a much larger amplitude and are correlated, which makes their statistical modeling more difficult.
Author
Statistical Analysis; Turbulent Mixing; Wavelet Analysis; Computerized Simulation; Vortices; Nonlinear Filters

20010021417 Wisconsin Univ., La Crosse, WI USA
Sub-Optimal Control Based Wall Models for LES, Including Transpiration Velocity
Baggett, J. S., Wisconsin Univ., USA; Nicoud, F., Centre Europeen Recherche et de Formation Advance en Calcul Scientific, France; Mohammadi, B., Montpellier Univ., France; Bewley, T., California Univ., USA; Gullbrand, J., Stanford Univ., USA; Botella, O., Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 331-342; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Most current wall models for the large eddy simulation (LES) of high Reynolds number turbulent boundary layers are ad hoc parameterizations of the wall stresses needed to close the finite-difference approximation to the viscous operator in terms of the tangential flow velocities at the first off-wall grid point. These models cannot compensate for the numerical and subgrid-scale modeling errors that are intrinsic to the severely underresolved LES in the near-wall region. by using the wall stress boundary conditions as control to force the solution towards the desired mean velocity profile, it is possible to find better wall stress models.

We consider the use of transpiration velocity in addition to the wall stresses as part of the approximate boundary conditions. In this work, optimal control theory is used to find a combination of wall stresses and transpiration velocity that improves the prediction of the mean velocity profile and the turbulence intensities in a coarse grid LES of high Reynolds number turbulent channel flow.
Author
Control Theory; Large Eddy Simulation; Optimal Control; Turbulent Boundary Layer; Turbulent Flow; Wall Flow; Channel Flow

20010021420 Scripps Institution of Oceanography, La Jolla, CA USA
Propagation of Internal Wave Packets in the Thermocline
Carnevale, G. F., Scripps Institution of Oceanography, USA; Orlandi, P., La Sapienza Univ., Italy; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 119-130; In English; See also 20010021392
Contract(s)/Grant(s): N00014-97-1-0095; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Internal wave packets propagating vertically in the oceanic thermocline are investigated with numerical simulations. For a typical set of environmental and packet parameters, it is shown that linear dispersion will have a significant effect on the spreading and decay in amplitude of these packets. Sufficiently strong packets are shown to generate turbulence that forms a continuous 'scar' of small-scale perturbations in their wake.
Author
Internal Waves; Computerized Simulation; Thermoclines; Wave Packets; Wave Propagation

20010021421 Dow Chemical Co., Plaquemine, LA USA
Modeling Turbulent Reacting Methane Thermochlorination Flows
Pitsch, H., Stanford Univ., USA; Harvey, A. D., Dow Chemical Co., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 181-191; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Motivations for and complications involved in modeling turbulent reacting chlorination flows are discussed. A confined turbulent nonpremixed reacting methyl chloride chlorination flow is investigated numerically using large eddy simulation and a Reynolds (Favre-) averaged Navier-Stokes approach with fully coupled chemistry and a detailed multi-step kinetic mechanism. A laminar diffusion flamelet turbulent combustion model is coupled with both the LES and the RANS codes to close the chemical source terms. A RANS solution neglecting chemical source term closure is also obtained. The different calculations are compared, and differences in the solutions are discussed. Computations including the flamelet turbulent combustion model predict a lower peak reaction temperature and a more gradual temperature increase, than predictions neglecting closure.
Author
Large Eddy Simulation; Navier-Stokes Equation; Reacting Flow; Methyl Chloride; Turbulent Combustion

20010021521 Oak Ridge National Lab., TN USA
Impacts of Venturi Turbulent Mixing on the Size Distribution of Sodium Chloride and Dioctyl-Phthalate Aerosols
Cheng, M. D.; Wainman, T.; Storey, J.; Aug. 01, 2000; 29p; In English
Report No.(s): DE00-763226; ORNL/TM-2000-181; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Internal combustion engines are a major source of airborne particulate matter (PM). The size of the engine PM is in the sub-micrometer range. The number of engine particles per unit volume is high, normally in the range of 10(sup 12) to 10(sup 14). to measure the size distribution of the engine particles dilution of an aerosol sample is required. A diluter utilizing a venturi ejector mixing technique is commercially available and tested. The purpose of this investigation was to determine if turbulence created by the ejector in the mini-dilutor changes the size of particles passing through it.
NTIS
Turbulent Mixing; Sodium Chlorides; Aerosols; Air Pollution; Particle Size Distribution

20010021592 Combustion Research and Flow Technology, Inc., Dublin, PA USA
Towards Simulating Non-Axisymmetric Influences on Aircraft Plumes for Signature Prediction
Kenzakowski, D. C., Combustion Research and Flow Technology, Inc., USA; Shipman, J. D., Combustion Research and Flow Technology, Inc., USA; Dash, S. M., Combustion Research and Flow Technology, Inc., USA; JANNAF 25th Exhaust Plume Technology Subcommittee and 7th SPIRITS User Group Joint Meeting; May 2000; Volume 1, pp. 229-255; In English; 25th; 7th; Exhaust Plume Technology Subcommittee, 15-18 May 2000, Las Vegas, NV, Las Vegas, NV, USA, USA; Sponsored by NASA, USA
Contract(s)/Grant(s): NAS3-99-98; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A methodology for efficiently including three-dimensional effects on aircraft plume signature is presented. First, exploratory work on the use of passive mixing enhancement devices, namely chevrons and tabs, in IR signature reduction for external turbofan plumes is demonstrated numerically and experimentally. Such small attachments, when properly designed, cause an otherwise axisymmetric plume to have significant 3D structures, affecting signature prediction. Second, an approach for including non-axisymmetric and installation effects in plume signature prediction is discussed using unstructured methodology. Unstructured flow solvers, using advanced turbulence modeling and plume thermochemistry, facilitate the modeling of aircraft effects on plume structure that previously have been neglected due to gridding complexities. The capabilities of the CRUNCH unstructured Navier-Stokes solver for plume modeling is demonstrated for a passively mixed turbofan nozzle, a generic fighter nozzle, and a complete aircraft.
Author
Navier-Stokes Equation; Plumes; Prediction Analysis Techniques; Signatures; Computational Fluid Dynamics; Direct Numerical Simulation; Three Dimensional Models

20010021729 Sierra Engineering, Inc., Carson City, NV USA
Modeling Tools for Propulsion Analysis and Computational Fluid Dynamics on the Internet
Muss, J. A., Sierra Engineering, Inc., USA; Johnson, C. W., Sierra Engineering, Inc., USA; Gotchy, M. B., Sierra Engineering, Inc., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 91-95; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA
Contract(s)/Grant(s): F04611-98-C-0016; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The existing RocketWeb(TradeMark) Internet Analysis System (http):://www.iohnsonrockets.com/rocketweb) provides an integrated set of advanced analysis tools that can be securely accessed over the Internet. Since these tools consist of both batch and interactive analysis codes, the system includes convenient methods for creating input files and evaluating the resulting data. The RocketWeb(TradeMark) system also contains many features that permit data sharing which, when further developed, will facilitate real-time, geographically diverse, collaborative engineering within a designated work group. Adding work group management functionality while simultaneously extending and integrating the system's set of design and analysis tools will create a system providing rigorous, controlled design development, reducing design cycle time and cost.
Author
Computational Fluid Dynamics; Real Time Operation; Internets

20010021745 Stanford Univ., Dept. of Mechanical Engineering, Stanford, CA USA
An Investigation of MEMS-Based Transducers for Boundary Layer Control ***Final Report, 1 Apr. 1995 - 31 May 1998***
Kumar, Sudeep M.; Reynolds, William C.; Kenny, Thomas W.; Dec. 21, 2000; 178p; In English
Contract(s)/Grant(s): F49620-95-1-0322
Report No.(s): AD-A385633; TF-79; AFRL-SR-BL-TR-00-0819; Copyright; Avail: Defense Technical Information Center (DTIC)

Using direct numerical simulations of turbulent channel flow, we present new insight into the generation of streamwise vortices near the wall, and an associated drag reduction strategy. Growth of x-dependent spanwise velocity disturbances w(x) is shown to occur via two mechanisms: (1) linear transient growth, which dominates early-time evolution, and (2) linear normal-mode instability, dominant asymptotically at late time (for frozen base flow streaks). Approximately 25% of streaks extracted from near-wall turbulence are shown to be strong enough for linear instability (above a critical vortex line Lift angle!. However, due to viscous annihilation of streak normal vorticity, normal mode growth ceases after a factor of two energy growth. In contrast, the linear transient disturbance produces a 20-fold amplification, due to its rapid, early-time growth before significant viscous streak decay. Thus, linear transient growth of w(x) is revealed as a new, apparently dominant, generation mechanism of x-dependent turbulent energy near the wall.
DTIC
Boundary Layer Control; Microelectromechanical Systems; Turbulent Flow; Turbulent Boundary Layer; Channel Flow; Piezoelectric Transducers

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INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Avionics and Aircraft Instrumentation; and 19 Spacecraft Instrumentation.

20010019986 NASA Marshall Space Flight Center, Huntsville, AL USA
Development of a NEW Vector Magnetograph at Marshall Space Flight Center
West, Edward, NASA Marshall Space Flight Center, USA; Hagyard, Mona, NASA Marshall Space Flight Center, USA; Gary, Allen, NASA Marshall Space Flight Center, USA; Smith, James, NASA Marshall Space Flight Center, USA; Adams, Mitzi, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Polarization and Remote Sensing IV, 29 Jul. - 3 Aug. 2001, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This paper will describe the Experimental Vector Magnetograph that has been developed at the Marshall Space Flight Center (MSFC). This instrument was designed to improve linear polarization measurements by replacing electro-optic and rotating wave-plate modulators with a rotating linear analyzer. Our paper will describe the motivation for developing this magnetograph, compare this instrument with traditional magnetograph designs, and present a comparison of the data acquired by this instrument and original MSFC vector magnetograph.
Author
Magnetic Signatures; Vector Spaces; Linear Polarization; Electro-Optics

20010020039 Lockheed Martin Missiles and Fire Control, Orlando, FL USA
Infrared Autonomous Acquisition and Tracking
Olson, Teresa L.; Lee, Harry C.; Jan. 2000; 6p; In English
Report No.(s): AD-A384928; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In order to demonstrate lock-on-after-launch (LOAL) capability, imaging infrared missile systems of the future require the ability to autonomously identify and track targets of interest. A robust algorithm architecture must have the flexibility to accommodate fluid system requirements driving its design. This paper describes a method to autonomously acquire and track an extended range target through its whole flight scenario. A proven ATR approach is used to detect and identify targets of interest, separating them into non-targets and clutter. The methodology uses a down selection strategic to nominate targets for terminal track. Once nominated, a Weighted Edge Tracker is employed. The tracker relies upon correlations of appropriately weighted edge directions from frame-to-frame images and reference templates. This combination of automatic target acquisition and terminal tracking provides a sophisticated yet simple approach to many challenging long range tracking problems.
DTIC
Target Acquisition; Tracking Problem; Infrared Tracking; Algorithms; Autonomy

20010020076 NASA Marshall Space Flight Center, Huntsville, AL USA
Development of a Polarimeter for Magnetic Field Measurements in the Ultraviolet
West, Edward, NASA Marshall Space Flight Center, USA; Porter, Jason, NASA Marshall Space Flight Center, USA; Davis, John, NASA Marshall Space Flight Center, USA; Gary, Allen, NASA Marshall Space Flight Center, USA; Adams, Mitzi, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Polarization Analysis and Measurement Analysis IV, 29 Jul. - 3 Aug. 2001, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This paper will describe the polarizing optics that are being developed for an ultraviolet magnetograph (SUMI) which will be flown on a sounding rocket payload. With a limited observing program, the polarizing optics were optimized to make simultaneous observation at two magnetic lines CIV (155nm) and MgII (280). This paper will give a brief overview of the SUMI instrument, will describe the polarimeter that will be used in the sounding rocket program and will present some of the measurements that have been made on the (SUMI) polarization optics.
Author
Magnetic Fields; Polarimeters; Sounding Rockets

20010020077 NASA Marshall Space Flight Center, Huntsville, AL USA

Optical Characteristics of the Marshall Space Flight Center Solar Ultraviolet Magnetograph

West, Edward, NASA Marshall Space Flight Center, USA; Porter, Jason, NASA Marshall Space Flight Center, USA; Davis, John, NASA Marshall Space Flight Center, USA; Gary, Allen, NASA Marshall Space Flight Center, USA; Adams, Mitzi, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; UV/EUV and Visible Space Instrumentation for Astronomy and Solar Physics, 29 Jul. - 3 Aug. 2001, San Diego, CA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This paper will describe the scientific objectives of the MSFC SUMI project and the optical components that have been developed to meet those objectives. In order to test the scientific feasibility of measuring magnetic fields in the UV, a sounding rocket payload is being developed, This paper will describe the optical measurements that have been made on the SUMI telescope mirrors and polarization optics.

Author

Sounding Rockets; Payloads; Optical Measurement; Magnetometers

20010020390 Aerospace Corp., Space Science Applications Lab., El Segundo, CA USA

Imaging Electron Spectrometer (IES) Electron Preprocessor (EPP) Design

Fennell, J. F., Aerospace Corp., USA; Osborn, J. V., Aerospace Corp., USA; Feb. 01, 2001; 15p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS5-31452

Report No.(s): AEROSPACE-ATR-2001(7252)-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Aerospace Corporation developed the Electron PreProcessor (EPP) to support the Imaging Electron Spectrometer (IES) that is part of the RAPID experiment on the ESA/NASA CLUSTER mission. The purpose of the EPP is to collect raw data from the IES and perform processing and data compression on it before transferring it to the RAPID microprocessor system for formatting and transmission to the CLUSTER satellite data system. The report provides a short history of the RAPID and CLUSTER programs and describes the EPP design. Four EPP units were fabricated, tested, and delivered for the original CLUSTER program. These were destroyed during a launch failure. Four more EPP units were delivered for the CLUSTER II program. These were successfully launched and are operating nominally on orbit.

Author

European Space Agency; NASA Space Programs; Cluster Mission

20010020474 NASA Pasadena Office, CA USA

The Next Generation MOD: A Microchip Amino Acid Analyzer for Detecting Extraterrestrial Life

Mathies, R. A., California Univ., USA; Hutt, L. D., California Univ., USA; Bada, J. L., Scripps Institution of Oceanography, USA; Glavin, D., Scripps Institution of Oceanography, USA; Grunthaner, F. J., NASA Pasadena Office, USA; Grunthaner, P. J., NASA Pasadena Office, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 209-210; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The MOD (Mars Organic Detector) instrument which has selected for the definition phase of the BEDS package on the 2005 Mars Explorer Program spacecraft is designed to simply detect the presence of amino acids in Martian surface samples at a sensitivity of a few parts per billion (ppb). An additional important aspect of amino acid analyses of Martian samples is identifying and quantifying which compounds are present, and also distinguishing those produced abiotically from those synthesized by either extinct or extant life. Amino acid homochirality provides an unambiguous way of distinguishing between abiotic vs. biotic origins. Proteins made up of mixed D- and L-amino acids would not likely have been efficient catalysts in early organisms because they could not fold into bioactive configurations such as the a-helix. However, enzymes made up of all D-amino acids function just as well as those made up of only L-amino acids, but the two enzymes use the opposite stereoisomeric substrates. There are no biochemical reasons why L-amino acids would be favored over Damino acids. On Earth, the use of only L-amino acids in proteins by life is probably simply a matter of chance. We assume that if proteins and enzymes were a component of extinct or extant life on Mars, then amino acid homochirality would have been a requirement. However, the possibility that Martian life was (or is) based on D-amino acids would be equal to that based on L-amino acids. The detection of a nonracemic mixture of amino acids in a Martian sample would be strong evidence for the presence of an extinct or extant biota on Mars. The finding of an excess of D-amino acids would provide irrefutable evidence of unique Martian life that could not have been derived from seeding the planet with terrestrial life (or the seeding of the Earth with Martian life). In contrast, the presence of racemic amino acids, along with non-protein amino acids such as alpha-aminoisobutyric acid and isovaline, would be indicative of an abiotic origin, although we

have to consider the possibility that the racemic amino acids were generated from the racemization of biotically produced amino acids.
Author
Extraterrestrial Life; Exobiology; Mars (Planet); Mars Surface Samples; Amino Acids; Enzymes

20010020476 NASA Johnson Space Center, Houston, TX USA
Martian Neutron Energy Spectrometer (MANES)
Maurer, R. H., Johns Hopkins Univ., USA; Roth, D. R., Johns Hopkins Univ., USA; Kinnison, J. D., Johns Hopkins Univ., USA; Goldsten, J. O., Johns Hopkins Univ., USA; Fainchtein, R., Johns Hopkins Univ., USA; Badhwar, G., NASA Johnson Space Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 213-214; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

High energy charged particles of extragalactic, galactic, and solar origin collide with spacecraft structures and planetary atmospheres. These primaries create a number of secondary particles inside the structures or on the surfaces of planets to produce a significant radiation environment. This radiation is a threat to long term inhabitants and travelers for interplanetary missions and produces an increased risk of carcinogenesis, central nervous system (CNS) and DNA damage. Charged particles are readily detected; but, neutrons, being electrically neutral, are much more difficult to monitor. These secondary neutrons are reported to contribute 30-60% of the dose equivalent in the Shuttle and MIR station. The Martian atmosphere has an areal density of 37 g/sq cm primarily of carbon dioxide molecules. This shallow atmosphere presents fewer mean free paths to the bombarding cosmic rays and solar particles. The secondary neutrons present at the surface of Mars will have undergone fewer generations of collisions and have higher energies than at sea level on Earth. Albedo neutrons produced by collisions with the Martian surface material will also contribute to the radiation environment. The increased threat of radiation damage to humans on Mars occurs when neutrons of higher mean energy traverse the thin, dry Martian atmosphere and encounter water in the astronaut's body. Water, being hydrogeneous, efficiently moderates the high energy neutrons thereby slowing them as they penetrate deeply into the body. Consequently, greater radiation doses can be deposited in or near critical organs such as the liver or spleen than is the case on Earth. A second significant threat is the possibility of a high energy heavy ion or neutron causing a DNA double strand break in a single strike.
Author
Mars (Planet); Mars Atmosphere; Cosmic Rays; Neutrons; Neutron Spectrometers

20010020480 NASA Johnson Space Center, Houston, TX USA
Mars Immunoassay Life Detection Instrument (MILDI)
McKay, David, NASA Johnson Space Center, USA; Steele, Andrew, Portsmouth Univ., UK; Allen, Carlton, Lockheed Martin Space Operations, USA; Thomas-Kepta, Kathie, Lockheed Martin Space Operations, USA; Schweitzer, Mary, Montana State Univ., USA; Priscu, John, Montana State Univ., USA; Sears, Joe, Montana State Univ., USA; Avci, Recep, Montana State Univ., USA; Firman, Keith, Portsmouth Univ., UK; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 219-220; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The direct detection of organic biomarkers for living or fossil microbes on Mars by an in situ instrument is a worthy goal for future lander missions. We have proposed an instrument based on immunological reactions to specific antibodies to cause activation of fluorescent stains. Antibodies are raised or acquired to a variety of general and specific substances that might be in Mars soil. These antibodies are then combined with various fluorescent stains and applied to small numbered spots on a small (two to three centimeters) test plate where they become firmly attached after drying. On Mars, a sample of soil from a trench or drill core is extracted with water and/or an organic solvent that is then applied to the test plate. Any substance, which has an antibody on the test plate, will react with its antibody and activate its fluorescent stain. A small ultraviolet light source will illuminate the test plate, which is observed with a small CCD camera. The numbered spots that fluoresce indicate the presence of the tested-for substance, and the intensity indicates relative amounts. The entire instrument can be quite small and light, on the order of ten cm in each dimension. A possible choice for light source may be small UV lasers at several wavelengths. Up to 1000 different sample spots can be placed on a plate 3 cm on a side, but a more practical number might be 100. Each antibody can have a redundant position for independent verification of reaction. Some of the wells or spots can contain simply standard fluorescent stains used to detect live cells, dead cells, DNA, etc. These the stains in these spots may be directly activated; no antibodies are necessary.
Author
Mars Surface; Mars Surface Samples; Extraterrestrial Life; Fossils; Antibodies; Immunoassay

20010020506 Max-Planck-Inst. fuer Chemie, Mainz, Germany

The Athena Alpha Proton X-Ray Spectrometer (APXS)

Rieder, R., Max-Planck-Inst. fuer Chemie, Germany; Brueckner, J., Max-Planck-Inst. fuer Chemie, Germany; Klingelhoefer, G., Mainz Univ., Germany; Gellert, R., Mainz Univ., Germany; Dreibus, G., Max-Planck-Inst. fuer Chemie, Germany; Lugmair, G., Max-Planck-Inst. fuer Chemie, Germany; Waenke, H., Max-Planck-Inst. fuer Chemie, Germany; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 267-268; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

During the Mars Pathfinder Mission in the summer of 1997, martian rocks were analyzed for the first time by a small instrument: the Alpha Proton X-Ray Spectrometer (APXS). This instrument was carried by the Sojourner rover to a number of soil and rock targets to obtain their elemental composition. The performance of the APXS permitted characterization of the landing site in an unprecedented way. New insights into soils and rocks on Mars were derived that could not have been obtained otherwise. An advanced APXS instrument has been designed for the comet nucleus lander on the European Rosetta mission. The flight version is being completed presently, and a copy of this instrument will be used as part of the Athena rover payload for in-situ exploration of Mars.

Author

Spacecraft Instruments; X Ray Spectrometers; Postflight Analysis

20010020514 Raytheon Co., Remote Sensing, Santa Barbara, CA USA

Advanced THEMIS for Orbital and Landed IR Imaging

Silverman, S., Raytheon Co., USA; Blasius, K., Raytheon Co., USA; Christensen, P. R., Arizona State Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 283-284; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Advanced THEMIS is a project to define and develop to breadboard stage, a miniature infrared imaging radiometer with applications to Mars orbiter and lander missions, as well as other planetary missions. The goal is to maintain or enhance functionality of the Thermal Emission Imaging System (THEMIS) now being built for the 2001 Mars Orbiter while reducing volume by approx. 75%. Other improvements expected are a broadened spectral range and improved radiometric calibration. A new generation of microbolometer detectors will be tested and further developed. These detectors have a new structure and smaller pitch, 25 microns vs. 50 microns used for THEMIS. Advanced THEMIS will be a substantially smaller instrument than THEMIS, so it will reduce the cost of multispectral thermal emission imaging on future missions. Candidate missions include Mars Orbiter missions after 2003 and Mars lander-rover missions. The reduction in mass may greatly improve science return from these and other planetary missions. Advanced THEMIS offers opportunities for science return in two areas: (1) surface mineralology and (2) atmospheric phenomena, similar to the Mars Global Surveyor Thermal Emission Spectrometer now in operation.

Author

Mars Missions; Radiometers; Spacecraft Instruments; Mission Planning; Specifications

20010020526 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

The Athena Raman Spectrometer

Wang, Alian, Washington Univ., USA; Haskin, Larry A., Washington Univ., USA; Jolliff, Bradley, Washington Univ., USA; Wdowiak, Tom, Alabama Univ., USA; Agresti, David, Alabama Univ., USA; Lane, Arthur L., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 304-305; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Raman spectroscopy provides a powerful tool for in situ mineralogy, petrology, and detection of water and carbon. The Athena Raman spectrometer is a microbeam instrument intended for close-up analyses of targets (rock or soils) selected by the Athena Pancam and Mini-TES. It will take 100 Raman spectra along a linear traverse of approximately one centimeter (point-counting procedure) in one to four hours during the Mars' night. From these spectra, the following information about the target will extracted: (1) the identities of major, minor, and trace mineral phases, organic species (e.g., PAH or kerogen-like polymers), reduced inorganic carbon, and water-bearing phases; (2) chemical features (e.g. Mg/Fe ratio) of major minerals; and (3) rock textural features (e.g., mineral clusters, amygdular filling and veins). Part of the Athena payload, the miniaturized Raman spectrometer has been under development in a highly interactive collaboration of a science team at Washington University and the University of Alabama at Birmingham, and an engineering team at the Jet Propulsion Laboratory. The development has completed the brassboard stage and has produced the design for the engineering model.

Author

Raman Spectroscopy; Spectrometers; Spacecraft Instruments; Mars Missions; Mineralogy

20010020529 Los Alamos National Lab., NM USA

Rapid Elemental Analysis at Stand-Off Distances Using the Libs Concept from the Mars Instrument Development Program

Wiens, R. C., Los Alamos National Lab., USA; Cremers, D. A., Los Alamos National Lab., USA; Ferris, M., Los Alamos National Lab., USA; Blacic, J. D., Los Alamos National Lab., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 310-311; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The elemental composition of rocks and soils is one of the most fundamental types of information needed to understand geologic contexts and to search for likely locations of biological activity. Nearly all methods for determining elemental composition involve in-situ analysis, requiring time-consuming maneuvering of a rover to acquire the desired sample. By contrast, analyses at stand-off distances allow nearly a ten-fold increase in the number of samples obtainable over in-situ techniques. Additionally, methods such as APXS have difficulty distinguishing between the pristine sample and rock coatings of either dust or weathering products. Under the auspices of the Mars Instrument Development Program, we have built and are testing a prototype LIBS (Laser-Induced Breakdown Spectroscopy) instrument which can rapidly determine elemental compositions at a distance. Additionally, by depth profiling micrometers to millimeters into the sample, LIDS can distinguish between dust or weathering products and the pristine sample. Here we summarize the LIBS concept, describe the initial performance of our prototype, including work at the combined rover tests in Nevada, and summarize potential LIBS contributions to the Mars exploration program.

Author

Chemical Analysis; Mars Surface; Mars Surface Samples; Spacecraft Instruments; Mars Missions

20010020534 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Subsurface Science from a Penetrator

Yen, Albert S., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 320-321; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Much of what we know about the geologic history and present state of Mars is based upon interpretations of data collected from the immediate surface. Unweathered soil samples covered by dust and sand sized particles may provide clues about the role of water and the biological history of the planet. The use of drills and scoops to obtain such samples for lander-based instruments implies the development of relatively large, sophisticated platforms. Small (several kilograms), scientifically focussed penetrators can carry instruments to the subsurface and should be included in the Mars exploration strategy.

Author

Mars Exploration; Mars Missions; Planetary Geology; Water

20010020535 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Water-Searchers: A Reconfigurable and Self Sustaining Army of Subsurface Exploration Robots Searching for Water/Ice Using Multiple Sensors

Youk, G. U., Inventors' Enterprise, Inc., USA; Whittaker, W. (Red), Carnegie-Mellon Univ., USA; Volpe, R., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 322; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Perhaps the most promising site for extant life on Mars today is where subsurface water has been maintained. Therefore, searching for underground water will provide a good chance to find evidence of life on Mars. The following are scientific/engineering questions that we want to answer using our approach: (1) Is there subsurface water/ice? How deep is it? How much is there? Is it frozen? (2) What kinds of underground layers exist in the Martian crust? (3) What is the density of Martian soil or regolith? Can we dig into it? Should we drill into it? (4) Can a sudden release of underground water occur if a big asteroid hits Mars? Our approach provides essential information to answer these questions. Moreover, dependence on the water content and depth in soil, not only resultant scientific conclusions but also proper digging/drilling methods, are suggested. 'How much water is in the Martian soil?' There can be several possibilities: (1) high water content that is enough to form permafrost; (2) low water content that is not enough to form permafrost; or (3) different layers with different moisture contents. 'How deep should a rover dig into soil to find water/ice?' The exact size-frequency distribution has not been measured for the soil particles. On-board sensors can provide not only the water content but also the density (or porosity) of Martian soil as a function of depth.

Author

Mars (Planet); Water; Mars Surface; Planetary Crusts; Moisture Content

20010020653 NASA Langley Research Center, Hampton, VA USA

Characteristics of Extrinsic Fabry-Perot Interferometric (EFPI) Fiber-Optic Strain Gages

Hare, David A., NASA Langley Research Center, USA; Moore, Thomas C., Sr., NASA Langley Research Center, USA; December 2000; 22p; In English

Contract(s)/Grant(s): RTOP 706-13-31-05

Report No.(s): NASA/TP-2000-210639; L-17979; NAS 1.60:210639; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The focus of this paper is a comparison of the strain-measuring characteristics of one type of commercially available fiber-optic strain sensor with the performance of conventional resistance strain gages. Fabry-Perot type fiber-optic strain sensors were selected for this testing program. Comparative testing is emphasized and includes load testing at room temperature with apparent strain characterization cryogenically and at elevated temperatures. The absolute accuracy of either of these types of strain gages is not addressed.

Author

Fabry-Perot Interferometers; Fiber Optics; Strain Gages

20010020790

Low temperature irradiation experiments of LHC thermometers

Amand, J. F.; Bujard, P.; Joly, C.; Junquera, T.; Thermeau, J.; Jan. 31, 1998; 35p; In French; In English

Report No.(s): DE99-605436; IPNO-98-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper presents the advancement of a program being carried out in view of selecting the cryogenic temperature sensors to be used in the CERN LHC collider. About 10,000 sensors will be installed around the 26.6 km LHC ring, and most of them will be exposed to high radiation doses during the accelerator lifetime. During the four irradiation experiment of 1997, 180 thermometers from 6 types have been exposed to high neutron fluences (>10(sup 15) n/cl(sup 2)) at the ISN (Grenoble, France) Cryogenic Irradiation Test Facility. A cryostat is placed in a shielded irradiation vault where a 20 MeV deuterons beam hits a thin Beryllium target, resulting in a well collimated and intense neutron beam. The characteristics of the cryogenic system, the acquisition and the irradiation facility are described. The main interest of this set-up is its ability to simulate the whole life of the LHC thermometers : same total neutron fluence, irradiation at superfluid Helium temperature, on-line acquisition of sensors resistance, several warm-up cycles. The resistance shifts of the different thermometer are presented.

NTIS

Cryogenic Temperature; Cryogenics; Low Temperature; Irradiation; Temperature Sensors; Thermometers; Cryostats

20010021108

Multipurpose proportional counter modules with a data readout system

Avakyan, K. M.; Saakyan, K.; Dec. 31, 1991; 24p; In Russian; In English

Report No.(s): DE99-604245; EFI-1328-23-91; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The multipurpose proportional counter modules with a data readout system designed by the authors for using in different units of the experimental complex ANI are described. The design of the counter and module is presented, the data readout system consisting of two-channel time-amplitude and time- digital converters with an electronic control system is described. The time- amplitude converter adjustment unit and a modernized system for data readout from hodoscopic counters are also described.

NTIS

Proportional Counters; Electronic Control

20010021182 NASA Marshall Space Flight Center, Huntsville, AL USA

Remote Sensing of Wind Fields and Aerosol Distributions with Airborne Scanning Doppler Lidar

Rothermel, Jeffry, NASA Marshall Space Flight Center, USA; Cutten, Dean R., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; Multi/Hyperspectral Sensors, Measurements, Modeling and Simulation, 7-9 Nov. 2000, Redstone Arsenal, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The coherent Doppler lidar, when operated from an airborne platform, offers a unique measurement capability for study of atmospheric and surface processes and feature. This is especially true for scientific objectives requiring measurements in optically-clear air, where other remote sensing technologies such as Doppler radar are at a disadvantage in terms of spatial resolution and coverage. The atmospheric lidar remote sensing groups of several US institutions, led by Marshall Space Flight Center, have developed an airborne coherent Doppler lidar capable of mapping the wind field and aerosol structure in three dimensions. The instrument consists of about a 1 Joule/pulse (eyesafe) lidar transceiver, telescope, scanner, inertial measurement unit, and operations control system to orchestrate all subsystem functions and tasks. The scanner is capable of directing the expanded lidar beam

in a variety of ways, in order to extract vertically resolved wind fields. Horizontal resolution is about 1 km; vertical resolution is even finer. Winds are obtained by measuring backscattered, Doppler-shifted laser radiation from naturally-occurring aerosol particles (on an order of 1 micron in diameter). Measurement coverage depends on aerosol spatial distribution and concentration. Velocity accuracy has been verified to be about 1 m/s. A variety of applications has been demonstrated during the three flight campaigns conducted during 1995-1998. Examples will be shown during the presentation. In 1995, boundary layer winds over the ocean were mapped with unprecedented resolution. In 1996, unique measurements were made of flow over the complex terrain of the Aleutian Islands; interaction of the marine boundary layer jet with the California coastal mountain range; a weak dry line in Texas - New Mexico; an upper tropospheric jet stream; the angular dependence of sea surface scattering; and in-flight radiometric calibration using the surface of White Sands National Monument. In 1998, the first measurements of eyewall and boundary layer winds within a hurricane were made with the airborne Doppler lidar. Potential future applications, and plans for improvements, will also be identified.
Author
Doppler Radar; Atmospheric Sounding; Optical Radar; Remote Sensing; Airborne Radar; Airborne Equipment; Remote Sensors; Wind (Meteorology); Aerosols

20010021296 Naval Research Lab., Washington, DC USA
Summer 1999 Mount Weather/Aberdeen Proving Grounds Field Test Report: Real-Time Detection of Military Ground Targets Using a VIS/NIR Hyperspectral Sensor ***Final Report***
Olchowski, Frederick M.; Stellman, Christopher M.; Michalowicz, Joseph V.; Nov. 27, 2000; 42p; In English
Report No.(s): AD-A384852; NRL/MR/5621-00-8516; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The following provides an overview of a VIS/NIR hyperspectral sensor system and two recent field experiments in which it was employed. The system hardware components, software interface, and processing methods are described in detail. A description of the test flight experiments and a preliminary analysis of the collected data are given.
DTIC
Real Time Operation; Remote Sensing; Computer Programs; Detection; Field Tests

20010021336 Prins Maurits Lab. TNO, Rijswijk, Netherlands
Automatic Analysis of Digital Images from a Phase-Stepped Holographic Interferometer ***Final Report***
Booij, S. M., Prins Maurits Lab. TNO, Netherlands; January 2001; 96p; In English; Original contains color illustrations
Contract(s)/Grant(s): B97D427; TNO Proj. 014.11149
Report No.(s): TD99-0185; TNO-PML-1999-B92; Copyright; Avail: Issuing Activity
A phase-stepped double reference beam holographic interferometer has been designed and built to visualize the shock wave interaction with scale models placed in a blast simulator. by smart reconstruction of the hologram by using two reference beams simultaneously, this interferometer set-up also allows the automated computation of the instantaneous pressure distribution from the interferograms. The software developed and the automation procedures were verified by using the interferometer on two test cases: the blast wave interaction with two rectangular structures and the reflection of a blast wave against a wedge. Comparison with local pressure gauge measurements and pressure contours as obtained by simulations with TNOs BLAST code showed good agreement. In the report the set-up is described and the results of the test cases are presented.
Author
Images; Phase Switching Interferometers; Holography; Holographic Interferometry; Digital Techniques; Computerized Simulation

20010021354 Osaka City Univ., Faculty of Engineering, Japan
Hologram Glasses Which Use Fresnel Diffraction
Yoshida, Hiroshi, Osaka City Univ., Japan; Nakamoto, Takeshi, Osaka City Univ., Japan; Mimura, Mikio, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 79-86; Copyright; Avail: Issuing Activity
Hologram glasses which use the Fresnel hologram are produced. Commercially available hologram glasses which use the Fourier hologram reconstruct symmetric twin images according to the plus and the minus first order diffracted lights. Because these two images overlap, the pattern cannot be placed near the center position. In contract to that, the hologram glasses using the Fresnel hologram can reconstruct a single image, therefore they can display more complicated image near the center position. The condition for a single image reconstruction is discussed.
Author
Hologrammetry; Holography; Fresnel Diffraction

20010021381 Catholic Univ. of America, Washington, DC USA

Rigorous Electromagnetic Analysis of Uncooled Microbolometer ***Final Report, 1 Jul. 1999 - 1 Jul. 2000***

Mirotznik, Mark S.; Nov. 22, 2000; 10p; In English; Original contains color plates

Contract(s)/Grant(s): DAAD19-99-1-0255

Report No.(s): AD-A385794; ARO-40127.1-PH; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The specific goal of this project was to develop a rigorous three dimensional electromagnetic model of an uncooled microbolometer array. The optical absorption of the thin-film thermal infrared detector was calculated as a function of wavelength, pixel size, incident angle and area fill factor using the finite-difference-time-domain (FDTD) method. The results indicate that smaller pixels absorb a significantly higher percentage of incident energy than larger pixels with the same fill factor. A polynomial approximation to the FDTD results was derived for use in system models. This model can then be used to analyze the coupling efficiency of the bolometer array as a function of various structural and source variations. These include varying the pixel pitch, fill factor and incident field wavelength and incident angle. Most Significant Findings: (1) The optical coupling efficiency of microbolometers varies as a complex function of the pixel pitch and fill factor. (2) Due to small pixel diffraction effects the coupling efficiency actually improves as the pixel size is reduced (3) There is an optimal combination of pixel pitch and fill factor that will maximize the coupling efficiency, and (4) The optical coupling is not sensitive to small variations in incident angle (is less than 45 degrees).
DTIC

Infrared Detectors; Bolometers; Thin Films; Electromagnetic Absorption; Optical Coupling; Light Transmission; Finite Difference Time Domain Method; Approximation

20010021602 NASA Marshall Space Flight Center, Huntsville, AL USA

Estimating Cosmic Ray Spectral Parameters From Simulated Detector Responses With Detector Design Implications

Howell, L. W., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

A simple power law model consisting of a single spectral index alpha (sub 1), is believed to be an adequate description of the galactic cosmic ray (GCR) proton flux at energies below 10(exp 13) eV, with a transition at knee energy E(sub k) to a steeper spectral index alpha(sub 2) greater than alpha(sub 1) above E(sub k). The maximum likelihood procedure is developed for estimating these three spectral parameters of the broken power law energy spectrum from simulated detector responses. These estimates and their surrounding statistical uncertainty are being used to derive the requirements in energy resolution, calorimeter size, and energy response of a proposed sampling calorimeter for the Advanced Cosmic ray Composition Experiment for the Space Station (ACCESS). This study thereby permits instrument developers to make important trade studies in design parameters as a function of the science objectives, which is particularly important for space-based detectors where physical parameters, such as dimension and weight, impose rigorous practical limits to the design envelope.
Author

Galactic Cosmic Rays; Spectrum Analysis; Detectors; Design Analysis; Estimating; Simulation

20010021672 Norfolk State Univ., VA USA

Manganese Doped YAlO3 as a Multi-Use Material for Holographic Recording, Holographic-Sensing, Optical Storage and Lasers ***Final Report, Nov. 1997 - Sep. 2000***

Loutts, George B.; Noginov, Mikhail A.; Sep. 2000; 44p; In English

Contract(s)/Grant(s): F49620-98-1-0101

Report No.(s): AD-A385452; AFRL-SR-BL-TR-00-0687; No Copyright; Avail: Defense Technical Information Center (DTIC)

High quality single crystals of manganese doped yttrium orthoaluminate, Mn:YAlO3 and it's analogs have be been grown by the Czochraski technique. The crystals have been characterized by chemical analysis, x-ray diffractometry, optical spectroscopy, electron paramagnetic resonance spectroscopy, and tested in the holographic recording experiments. Mn(2-) Mn(3+), and Mn(4+) ions were identified and described in as-grown crystals. The reversible photoexcitation reaction Mn(4+) Mn(5+) + e and associated with it coloration and diffraction grating recording were studied in detail. The efficient diffraction grating recording was obtained in the crystals in one-color recording scheme and two-color recording scheme. Holographic recording tests of Mn:YAlO3 at IBM Almaden Research Center demonstrated high potential of the material of applications in optical data storage. The project generated significant interest among students and faculty at Norfolk State.
DTIC

Chemical Analysis; Yttrium; Manganese; Doped Crystals; Optical Memory (Data Storage); Data Storage

20010021695 NASA Marshall Space Flight Center, Huntsville, AL USA

High-Speed Observer: Automated Streak Detection in SSME Plumes

Rieckoff, T. J., NASA Marshall Space Flight Center, USA; Covan, M., United Space Alliance, USA; OFarrell, J. M., United Space Alliance, USA; February 2001; 24p; In English

Report No.(s): NASA/TM-2001-210798; NAS 1.15:210798; M-1000; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A high frame rate digital video camera installed on test stands at Stennis Space Center has been used to capture images of Space Shuttle main engine plumes during test. These plume images are processed in real time to detect and differentiate anomalous plume events occurring during a time interval on the order of 5 msec. Such speed yields near instantaneous availability of information concerning the state of the hardware. This information can be monitored by the test conductor or by other computer systems, such as the integrated health monitoring system processors, for possible test shutdown before occurrence of a catastrophic engine failure.

Author

Plumes; High Speed Photography; Engine Monitoring Instruments; Digital Cameras

36
LASERS AND MASERS

Includes lasing theory, laser pumping techniques, maser amplifiers, laser materials, and the assessment of laser and maser outputs. For cases where the application of the laser or maser is emphasized see also the specific category where the application is treated. For related information see also 76 Solid-State Physics.

20010019854 Princeton Plasma Physics Lab., Princeton, NJ USA

Pulse Compression in Plasma: Generation of Femtosecond Pulses without CPA

Shvets, G.; Fisch, N. J.; Pukhov, A.; Meyer-ter-Vehn, J.; Jul. 20, 2000; 6p; In English

Report No.(s): DE00-758641; PPPL-3474; No Copyright; Avail: Department of Energy Information Bridge

Laser pulses can be efficiently compressed to femtosecond duration when a smaller-frequency short pulse collides with high frequency long pulse in rare plasma, absorbing most of its energy. The mechanism of short pulse amplification is nonlinear superradiance.

NTIS

Pulse Compression; Pulsed Lasers; Cold Plasmas; Laser Beams; Parametric Amplifiers

20010020022 NASA Marshall Space Flight Center, Huntsville, AL USA

Performance Modeling of Experimental Laser Lightcrafts

Wang, Ten-See, NASA Marshall Space Flight Center, USA; Chen, Yen-Sen, Engineering Sciences, Inc., USA; Liu, Jiwen, Engineering Sciences, Inc., USA; Myrabo, Leik N., Rensselaer Polytechnic Inst., USA; Mead, Franklin B., Jr., Air Force Research Lab., USA; [2001]; 10p; In English; 39th; Serospace Sciences, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-0648; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

A computational plasma aerodynamics model is developed to study the performance of a laser propelled Lightcraft. The computational methodology is based on a time-accurate, three-dimensional, finite-difference, chemically reacting, unstructured grid, pressure-based formulation. The underlying physics are added and tested systematically using a building-block approach. The physics modeled include non-equilibrium thermodynamics, non-equilibrium air-plasma finite-rate kinetics, specular ray tracing, laser beam energy absorption and refraction by plasma, non-equilibrium plasma radiation, and plasma resonance. A series of transient computations are performed at several laser pulse energy levels and the simulated physics are discussed and compared with those of tests and literatures. The predicted coupling coefficients for the Lightcraft compared reasonably well with those of tests conducted on a pendulum apparatus.

Author

Computational Fluid Dynamics; Performance Prediction; Laser Propulsion; Light Aircraft; Plasma Dynamics

20010020686

Some questions of theory of the acoustic laser

Zavtrak, S. T.; Puzynin, I. V.; Amirkhanov, I. V.; Zejnalova, O. V.; Zejnalov, S.; Dec. 31, 1998; 20p; In English

Report No.(s): DE99-602101; JINR-E-11-97-358; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A theoretical scheme of acoustic analog of laser (saser) was suggested and investigated numerically with the help of the computer simulation procedure. The suggested scheme for the saser is analogous to a well-known scheme of a free electron laser (FEL) where an electromagnetic emission is created by the self-synchronized electron beam moving through magnetic periodic systems. A computational model of the saser was described by a system of three nonlinear differential equations with partial derivatives. The simulation was performed in a wide range of physical parameters for active media and resonator. The obtained results are in good agreement with the results known for FEL.

NTIS

Lasers; Acoustics

20010020881 Utah State Univ., Logan, UT USA

Alexandrite Lidar Receiver ***Final Report, 1 Jul. 1995-31 Dec. 1996***

Wilkerson, Thomas D., Utah State Univ., USA; Nov. 2000; 10p; In English; Original contains color plates

Contract(s)/Grant(s): DAAH04-95-1-0390

Report No.(s): AD-A385770; ARO-34726.1-EV-RIP; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Utah State University's responsibility to the U.S. Army Research Office and the DoD's DURIP Program was to design, and obtain from a vendor, an "Alexandrite Lidar Receiver". The chosen vendor, Orca Photonics, In. (Redmond, WA), in close collaboration with USU personnel, built a portable, computerized lidar system that not only is suitable as a receiver for a near IR alexandrite laser, but also contains an independent Nd: YAG laser tor stand alone lidar operations at 532nm. The LRS-100 lidar delivered under this contract has two analog PMT receivers channels to detected both in daytime as well as at night. Though zenith observations are the typical operational mode of the Orca lidar, we also demonstrated off-zenith lidar measurements using a mirror beam director and a holographic transmission grating (HTG) on the receiving telescope ARO's satisfaction with the Orca lidar has led to funding for a separate USU contract to Orca (now completed under DURIP sponsorship) to add two digital (Photon counting) channels for greater sensitivity and range, particularly for nighttime observations. ORCA Photonics, Inc. has proved to be an excellent, responsive vendor for industry-university collaborations.

DTIC

Optical Radar; Infrared Lasers; Receivers; Radar Measurement; Near Infrared Radiation

20010021383 North Carolina Central Univ., Durham, NC USA

Development of a Smith-Purcell Free Electron Laser Driven by the NCCU Microwave Gun ***Final Report, 1 Jul. 1996 - 30 Jun. 2000***

Jones, C. R.; Dec. 28, 2000; 3p; In English

Contract(s)/Grant(s): DAAH04-96-1-0258

Report No.(s): AD-A385797; ARO-35598.3-PH-SAH; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The intent of this project was to study the operation of a Smith-Purcell FEL (SP-FEL) when driven by the short, high-power, relativistic electron micropulses produced by the NCCU Electron Gun. The motivation was the development of an SP-FEL that would bridge the wavelength range from the sub-mm up to the infrared, a wavelength range for which an easily tunable, coherent source would be a major advance. During the period of this project, the electron gun, the interaction chamber, gratings, and the diagnostic systems were developed to conduct the proposed study. The spontaneous radiation generated when the electron beam passed over a grating was studied. The initial conclusion is that Smith-Purcell radiation from the grating was mixed with a significant amount of transition radiation, produced when portions of the relativistic electron beam strike the body of the grating. The strength of the Smith-Purcell radiation compared to the transition radiation suggests that, at least for the experimental conditions used in this experiment, the coupling of the electron beam to the grating was inefficient.

DTIC

Free Electron Lasers; Tunable Lasers; Coherent Radiation; Micropulsations; Relativistic Electron Beams; Optical Pumping

20010021509 Los Alamos National Lab., NM USA

Indirect Drive Experiments on the OMEGA Laser at the Laboratory for Laser Energetics of the University of Rochester: Pre-Shot Report, ACE-A and ACE-B, ***11-13 Jul. 2000***

Batha, S.; Caldwell, S.; Kyrala, G.; Jul. 2000; 36p; In English; Original contains color illustrations

Report No.(s): PB2001-102968; LA-UR-00-9899; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contents include the following: Overview; (Diagnostic list for the week); ACE-A (Experimental template, Beam requirements, Shot schedule, QXI-in-close); ACE-B (Experimental template, Shot list, Special pinhole and diagnostic settings, Film processing, SXRC, Laser alignment sorted by Beam termination, Laser Alignment sorted by Beam number, Laser timing, Target views, Notes on target design, Diagnostic Pointing List, Alignment Procedure, Appendix-I (Workmans notes on Henway), Appendix-II (Transmission of Filters), Appendix-III LAPC notes by Workman); Contact list of key personnel.
NTIS
Laser Power Beaming; Laser Beams; Laser Targets; Inertial Confinement Fusion; Plasmas (Physics)

20010021743 Montana State Univ., Dept. of Physics, Bozeman, MT USA
Very-Narrow-Line Semiconductor Laser and Optical Clocks Based on Spectral Hole Burning Frequency Standards ***Final Report, Sep. 1996 - Sep. 1999***
Cone, Rufus L.; Oct. 12, 2000; 24p; In English
Contract(s)/Grant(s): F49620-96-1-0466
Report No.(s): AD-A385454; AFRL-SR-BL-TR-00-0685; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Single-frequency diode lasers were stabilized to 500Hz precision at 1.5 microns and to 20Hz at 793nm on 10-ms time scales using narrow spectral holes in absorption lines of Er and Tm doped cryogenic crystals as frequency references and without vibrational isolation of either the laser or frequency reference. Kilohertz stability for 100 seconds is provided by these techniques, and that performance is extendable to longer time scales with further development. Miniaturized lasers and 2 mm-sized reference crystals will provide compact portable packages with a closed cycle cryocooler. The achieved frequency stabilization provides ideal lasers for high-resolution spectroscopy, real time optical signal processing based on spectral holography, and other applications requiring ultra-narrow-band light sources or coherent detection. Feedback for stabilizing the frequency of external cavity diode lasers was derived from Pound-Drever-Hall frequency modulation probing of the spectral hole and used to control diode laser current and grating tilt. Stabilization to spectral holes is applicable to DFB lasers and other lasers and to other transducers like acousto-optic or electro-optic frequency shifters. Studies of frequency reference materials provided crystals that are programmable long-term references with spectral holes persisting up beyond liquid nitrogen temperatures. Crystal frequency references are insensitive to vibration and could be mass-produced.
DTIC
Absorption Spectra; Frequency Standards; Hole Burning; Optical Materials

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 Cybernetics, Artificial Intelligence, and Robotics; and 54 Man/System Technology and Life Support.

20010020156 NASA Marshall Space Flight Center, Huntsville, AL USA
Development Activities on Airbreathing Combined Cycle Engines
McArthur, J. Craig, NASA Marshall Space Flight Center, USA; [2000]; 19p; In English, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contents include the following: Advanced reusable transportation(ART); aerojet and rocketdyne tests, RBCC focused concept flowpaths,fabricate flight weigh, test select components, document ART project, Istar (Integrated system test of an airbreathing rocket); combined cycle propulsion testbed;hydrocarbon demonstrator tracebility; Istar engine system and vehicle system closure study; and Istar project planning.
CASI
Air Breathing Engines; Project Planning; Design Analysis

20010020158 NASA Marshall Space Flight Center, Huntsville, AL USA
Unshrouded Impeller Technology Development Status
Droege, Alan R., NASA Marshall Space Flight Center, USA; Williams, Robert W., NASA Marshall Space Flight Center, USA; Garcia, Roberto, NASA Marshall Space Flight Center, USA; [2000]; 10p; In English; 12th; PERC Prolusion Symposium, 26-27 Oct. 2000, Cleveland,OH, USA; Sponsored by Political Economy Research Center, USA
Contract(s)/Grant(s): NRA8-21; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

To increase payload and decrease the cost of future Reusable Launch Vehicles (RLVs), engineers at NASA/MSFC and Boeing, Rocketdyne are developing unshrouded impeller technology for application to rocket turbopumps. An unshrouded two-stage high-pressure fuel pump is being developed to meet the performance objectives of a three-stage shrouded pump. The new pump will have reduced manufacturing costs and pump weight. The lower pump weight will allow for increased payload.
Author
Fuel Pumps; Impellers; Two Stage Turbines; Design Analysis

20010020423 Virginia Polytechnic Inst. and State Univ., Dept. of Mechanical Engineering, Blacksburg, VA USA
A Distributed Active Vibration Absorber (DAVA) and Associated Control Approaches for Active-Passive Reduction of Sound and Vibration ***Final Report, 15 May 1999-14 Aug 2000***
Fuller, Chris R.; Jan. 04, 2001; 11p; In English
Contract(s)/Grant(s): N00014-99-1-0705
Report No.(s): AD-A385630; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Develop and demonstrate a prototype distributed active vibration absorber (DAVA) which is lightweight, conformal and cost effective. to develop and demonstrate a bio hierarchical controller approach for high actuators/sensor count system. to develop and demonstrate associated design procedures. To initiate transition of the technology to applications in AF launch vehicles payloads, USN Next Generation Torpedoes and NASA Aircraft Interior Noise Programs.
DTIC
Active Control; Vibration; Aircraft Noise; Launch Vehicles

20010021328 NASA Marshall Space Flight Center, Huntsville, AL USA
Lubrication of Space Shuttle Main Engine Turbopump Bearings
Gibson, Howard, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English, 20-24 May 2001, Orlando, FL, USA; Sponsored by Society of Tribologists and Lubrication Engineers, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Space Shuttle has three main engines that are used for propulsion into orbit. These engines are fed propellants by four turbopumps on each engine. A main element in the turbopump is the bearings supporting the rotor that spins the turbine blades and the pump impeller. These bearings are required to spin at very high speeds, support radial and thrust loads, and have high wear resistance without the benefit of lubrication. The liquid hydrogen and oxygen propellants flow through the bearings to cool the surfaces. The volatile nature of the propellants excludes any conventional means of lubrication. Lubrication for these bearings is provided by the ball separator inside the bearing. The separator is a composite material that supplies a transfer film of lubrication to the rings and balls. New separator materials and lubrication schemes have been investigated at Marshall Space Flight Center in a bearing test rig with promising results. Hybrid bearings with silicon nitride balls have also been evaluated. The use of hybrid, silicon nitride ball bearings in conjunction -with better separator materials has shown excellent results. The work that Marshall has done is being utilized in turbopumps flying on the space shuttle fleet and will be utilized in future space travel. This result of this work is valuable for all aerospace and commercial applications where high-speed bearings are used.
Author
Ball Bearings; Liquid Hydrogen; Lubrication; Silicon Nitrides; Wear Resistance

20010021707 Building and Construction Research TNO, Delft, Netherlands
Shock Testing of a: Central Operable Quick Lock Door, Type VII A, nr. A2305 Central Operable Hatch, Type VA, nr A2252 Manufacturer Van Dam
VanBragt, F. J., Building and Construction Research TNO, Netherlands; Jun. 22, 2000; 51p; In English; Original contains color illustrations
Contract(s)/Grant(s): Proj. 006.93132; Proj. 006.93321
Report No.(s): TNO-2000-CMC-R036; Copyright; Avail: Issuing Activity

A central operable quick lock door, type VII A nr. A2305 and a central operable hatch, type VA nr.A2252, manufactured by van Dam, have been subjected to shock tests in accordance with shock specifications for the LCF frigate. The door has been tested to shock grade CR in three mutual perpendicular orientations. The hatch has been subjected to six series of shock tests according to shock grade CR and BR. The hatch passed shock grade BR requirements after various modifications. The original hatch meets shock grade DR requirements.
Author
Doors; Hatches; Shock Tests; Locks (Fasteners); Ships; Mechanical Devices

20010021726 Concepts ETI, Inc., White River Jct, VT USA

Design Study for A Low-Cost LH2 Turbopump

Japikse, David, Concepts ETI, Inc., USA; Baines, Nicholas, Concepts ETI, Inc., USA; Platt, Michael J., Concepts ETI, Inc., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 129-138; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A preliminary design study, focusing on potential component selections and design for manufacturing and assembly (DFMAR1) analysis, is presented in this study. The investigation focused on a nominal cost liquid hydrogen turbopump suitable for a private launch class vehicle. Utilizing a ”turbocharger-like” design philosophy, preliminary feasibility studies of the basic pump design class, the rotordynamic design class, and the turbine design class were conducted with associated DFMA evaluations. Reasonable cost levels and sensible levels of product assurance have been established.

Author

Rotor Dynamics; Turbine Pumps; Design Analysis; Feasibility

20010021753 Bettis Atomic Power Lab., West Mifflin, PA USA

Diffusion Bonding of Silicon Carbide and Boron Carbide Using Refractory Metals

Cockeram, B. V.; Oct. 01, 1999; 11p; In English; ASM Materials Solution 99: International Conference on Joining of Advanced and Specialty Metals, 1 Nov. 1999, Cincinnati, OH, USA; Sponsored by American Society for Metals, USA

Report No.(s): DE00-755392; B-T-3255; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Joining is an enabling technology for the application of structural ceramics at high temperatures. Metal foil diffusion bonding is a simple process for joining silicon carbide or boron carbide by solid-state, diffusive conversion of the metal foil into carbide and silicide compounds that produce bonding. Metal diffusion bonding trials were performed using thin foils (5 to 100 micro m) of refractory metals (niobium, titanium, tungsten, and molybdenum) with plates of silicon carbide (both alpha-SiC and beta-SiC) or boron carbide that were lapped flat prior to bonding. The influence of bonding temperature, bonding pressure, and foil thickness on bond quality was determined from metallographic inspection of the bonds. The microstructure and phases in the joint region of the diffusion bonds were evaluated using SEM, microprobe, and AES analysis. The use of molybdenum foil appeared to result in the highest quality bond of the metal foils evaluated for the diffusion bonding of silicon carbide and boron carbide. Bonding pressure appeared to have little influence on bond quality. The use of a thinner metal foil improved the bond quality. The microstructure of the bond region produced with either the alpha-SiC and beta-SiC polytypes were similar.

NTIS

Bonding; Boron Carbides; Refractory Metals; Silicon Carbides; Diffusion Welding; Metal Bonding; Metal Foils; Microanalysis

38
QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

20010020236 National Inst. of Standards and Technology, Electricity Div., Gaithersburg, MD USA

Electronics and Electrical Engineering Laboratory, Electricity Division: Programs, Activities, and Accomplishments

Jan. 2001; 86p; In English

Report No.(s): PB2001-101234; NISTIR-6587; Copyright; Avail: National Technical Information Service (NTIS)

Topics discussed include: The Electronic Kilogram; Realization of the SI Farad and Ohm; Waveform Synthesis and Impedance Metrology; Waveform Synthesis and Impedance Metrology; Waveform Acquisition Devices and Standards; Metrology for Electric Power Systems; Flat Panel Display Metrology; Infrastructure for Integrated Electronic Manufacturing; Plasma Processing and Gaseous Dielectrics; Postdoctoral Research Associateships; Electricity Division Organization.

NTIS

Electronics; Electrical Engineering; Research and Development

39
STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

20010019830 Utah Univ., Dept. of Electrical Engineering, Salt Lake City, UT USA
Adaptive Algorithms for Active Noise and Vibration Control ***Final Report, 1 May 1998 - 30 Apr. 2000***
Bodson, Marc; Jul. 17, 2000; 181p; In English
Contract(s)/Grant(s): DAAH04-96-1-0085
Report No.(s): AD-A385133; ARO-34533.11-MA; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The objective of this project was to develop and analyze advanced adaptive schemes for the active attenuation of sound and vibration. Implementations of algorithms such as the filtered-X LMS algorithm were proposed that require fewer computations than the standard implementation. Delay compensation techniques were also developed to combat performance reducing effects due to delay within the parameter updates. In particular, the extension of the method to adaptive echo cancellation was investigated. Progress was also made on adaptive algorithms for the rejection of periodic disturbances without measurement of the disturbance or of its frequency. A direct approach and an indirect approach were studied, and the resulting algorithms were tested successfully on an active noise control testbed. Disturbances with multiple harmonics and multi-channel systems were both considered.
DTIC
Algorithms; Noise Reduction; Vibration; Adaptive Control

20010019890 NASA Marshall Space Flight Center, Huntsville, AL USA
Investigation of Nonlinear Pressurization and Model Restart in MSC/NASTRAN for Modeling Thin Film Inflatable Structures
Smalley, Kurt B., Clarkson Univ., USA; Tinker, Michael L., NASA Marshall Space Flight Center, USA; Fischer, Richard T., NASA Marshall Space Flight Center, USA; Apr. 19, 2001; 8p; In English; AIAA Structures, Structural Dynamics, and Materials Conference, 16-19 Apr. 2001, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 713-78-10
Report No.(s): AIAA Paper 2001-1409; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper is written for the purpose of providing an introduction and set of guidelines for the use of a methodology for NASTRAN eigenvalue modeling of thin film inflatable structures. It is hoped that this paper will spare the reader from the problems and headaches the authors were confronted with during their investigation by presenting here not only an introduction and verification of the methodology, but also a discussion of the problems that this methodology can ensue. Our goal in this investigation was to verify the basic methodology through the creation and correlation of a simple model. An overview of thin film structures, their history, and their applications is given. Previous modeling work is then briefly discussed. An introduction is then given for the method of modeling. The specific mechanics of the method are then discussed in parallel with a basic discussion of NASTRAN s implementation of these mechanics. The problems encountered with the method are then given along with suggestions for their work-a-rounds. The methodology is verified through the correlation between an analytical model and modal test results of a thin film strut. Recommendations are given for the needed advancement of our understanding of this method and ability to accurately model thin film structures. Finally, conclusions are drawn regarding the usefulness of the methodology.
Author
Nonlinearity; Pressure; Mathematical Models; Inflatable Structures

20010020154 Lockheed Martin Michoud Space Systems, New Orleans, LA USA
Subscale Composite Liquid Oxygen Tank Testing
Graf, Neil A., Lockheed Martin Michoud Space Systems, USA; Davis, Kevin, Lockheed Martin Michoud Space Systems, USA; McBain, Michael, Lockheed Martin Michoud Space Systems, USA; [2000]; 13p; 32nd; SAMPE International Technical Conference, 5-9 Nov. 2000, Boston, MA, USA; Sponsored by Society for the Advancement of Materials and Process Engineering, USA
Contract(s)/Grant(s): NCC8-115; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Lockheed Martin Space Systems Company recently completed a two-year fabrication and test program on subscale composite liquid oxygen (LO2) tanks. The goals of this program included the development of fabrication and inspection techniques, cryogenic acceptance testing of composite articles, and demonstrating oxygen compatibility under launch vibration loads. Two subscale diameter test bottles were fabricated using a proprietary Lockheed Martin material, known as LM21C03. The bottles

were then inspected using an array of NDE techniques and then put through a cryogenic acceptance test program at Lockheed Martin. A NASA/Lockheed Martin test team then subjected a composite bottle to testing at an X-33 vibration profile for 15 minutes at use pressure. The tests were run at various LO2 fill levels, with and without intentionally added debris. All tests were successful in that the composite bottle showed no signs of ignition or combustion as a result of the vibration testing. This test program is an important bridge between coupon-level and subcomponent LO2 compatibility tests and full-scale composite LO2 tank use. Author

Aerospace Systems; Product Development; Composite Propellants; Liquid Oxygen; Propellant Tanks

20010020246 NASA Marshall Space Flight Center, Huntsville, AL USA

A Comparison of Quasi-Static Indentation Testing to Low Velocity Impact Testing

Nettles, Alan T., NASA Marshall Space Flight Center, USA; Douglas, Michael J., International Construction Equipment, USA; Mar. 29, 2001; 14p; In English; ASTM Symposia on Composites, 26-29 Mar. 2001, Phoenix, AZ, USA; Sponsored by American Society for Testing and Materials, USA

Contract(s)/Grant(s): RTOP 713-20-38; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The need for a static test method for modeling low-velocity foreign object impact events to composites would prove to be very beneficial to researchers since much more data can be obtained from a static test than from an impact test. In order to examine if this is feasible, a series of static indentation and low velocity impact tests were carried out and compared. Square specimens of many sizes and thickness were utilized to cover the array of types of low velocity impact events. Laminates with a n/4 stacking sequence were employed since this is by the most common type of engineering laminate. Three distinct flexural rigidities under two different boundary conditions were tested in order to obtain damage due to large deflections, contact stresses and both to examine if the static indentation-impact comparisons are valid under the spectrum of damage modes that can be experienced. Comparisons between static indentation and low velocity impact tests were based on the maximum applied transverse load. The dependent parameters examined included dent depth, back surface crack length, delamination area and to a limited extent, load-deflection behavior. Results showed that no distinct differences could be seen between the static indentation tests and the low velocity impact tests, indicating that static indentation can be used to represent a low velocity impact event.
Author

Impact Tests; Impact Loads; Crack Propagation; Deformation; Surface Cracks

20010020730

EFAM ETM 97: The ETM method for assessing the significance of crack- like defects in engineering structures, comprising the versions ETM 97/1 and ETM 97/2

Schwalbe, K. H.; Zerbst, U.; Kim, Y. J.; Brocks, W.; Cornec, A.; Dec. 31, 1998; 150p; In English

Report No.(s): DE98-773707; GKSS-98/E/6; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

EFAM ETM 97 is a document of the GKSS Procedure 'Engineering Flaw Assessment Method (EFAM)'. It describes methods for estimating the crack driving force for cracks in structural components in terms of the crack tip opening displacement, (delta)(sub 5), and the J-integral. It consists of several modules covering particular application problems. Appendices to this document provide solutions for the stress intensity factor and the yield load, as well as information on transferability of fracture parameters and on the treatment of bi-axial and mixed mode loadings. A second assessment route is also given in an appendix.
NTIS

Crack Propagation; Stress Intensity Factors; Structural Design; Displacement

20010020912

Proceedings CORENDE: Regional congress on nondestructive and structural evaluation

Dec. 31, 1997; 403p; In Spanish; In English; Spanish, English, Portuguese. CORENDE: regional congress on nondestructive and structural evaluation

Report No.(s): DE99-604259; INIS-AR-133; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Works are presented at the CORENDE: Regional Congress on Nondestructive and Structural Evaluation organized by the National Atomic Energy Commission and the National Technological University (Mendoza). This congress wants to be the forum where people from research, industry and marketing might meet and discuss ideas towards the fostering of these new cultural habits. Papers covering all disciplines contributing to the evaluation of components, systems and structures are welcome: nondestructive evaluation methods and techniques (ultrasound, eddy currents and other electromagnetic methods, acoustic emission, radiography, thermography, leak testing, dye-penetrants, visual inspection, etc.), personnel certification, welding inspection, non-

destructive metallography, optics and lasers, fluid-structure interaction, vibrations, extensometry, modelling of structures refs., ills.
NTIS
Conferences; Nondestructive Tests

20010020953 NASA Marshall Space Flight Center, Huntsville, AL USA
MPLM On-Orbit Interface Dynamic Flexibility Modal Test
Bookout, Paul S., NASA Marshall Space Flight Center, USA; Rodriguez, Pedro I., NASA Marshall Space Flight Center, USA; Tinson, Ian, Alenia Spazio S.p.A., Italy; Fleming, Paolo, Alenia Spazio S.p.A., Italy; [2001]; 9p; In English; 42nd; Structures, Structural Dynamics and Materials, 16-19 Apr. 2001, Seattle, WA, USA
Contract(s)/Grant(s): RTOP 478-85-12; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Now that the International Space Station (ISS) is being constructed, payload developers have to not only verify the Shuttle-to-payload interface, but also the interfaces their payload will have with the ISS. The Multi Purpose Logistic Module (MPLM) being designed and built by Alenia Spazio in Torino, Italy is one such payload. The MPLM is the primary carrier for the ISS Payload Racks, Re-supply Stowage Racks, and the Resupply Stowage Platforms to re-supply the ISS with food, water, experiments, maintenance equipment and etc. During the development of the MPLM there was no requirement for verification of the on-orbit interfaces with the ISS. When this oversight was discovered, all the dynamic test stands had already been disassembled. A method was needed that would not require an extensive testing stand and could be completed in a short amount of time. The residual flexibility testing technique was chosen. The residual flexibility modal testing method consists of measuring the free-free natural frequencies and mode shapes along with the interface frequency response functions (FRF's). Analytically, the residual flexibility method has been investigated in detail by, MacNeal, Martinez, Carne, and Miller, and Rubin, but has not been implemented extensively for model correlation due to difficulties in data acquisition. In recent years improvement of data acquisition equipment has made possible the implementation of the residual flexibility method as in Admire, Tinker, and Ivey, and Klosterman and Lemon. The residual flexibility modal testing technique is applicable to a structure with distinct points (DOF) of contact with its environment, such as the MPLM-to-Station interface through the Common Berthing Mechanism (CBM). The CBM is bolted to a flange on the forward cone of the MPLM. During the fixed base test (to verify Shuttle interfaces) some data was gathered on the forward cone panels. Even though there was some data on the forward cones, an additional modal test was performed to better characterize its behavior. The CBM mounting flange is the only remaining structure of the MPLM that no test data was available. This paper discusses the implementation of the residual flexibility modal testing technique on the CBM flange and the modal test of the forward cone panels.
Author
Maintenance; Space Station Modules; Interfaces; Prelaunch Tests

20010020956 NASA Goddard Space Flight Center, Greenbelt, MD USA
Results of the HESSI Test Mishap Investigation
Worth, Daniel B., NASA Goddard Space Flight Center, USA; Phillips, Rodney N., NASA Marshall Space Flight Center, USA; 10p; In English; Shock and Vibration Symposium, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

On March 21, 2000, the High-Energy Solar Spectroscopic Imager (HESSI) spacecraft was subjected to a series of vibration tests at the Jet Propulsion Laboratory (JPL) as a part of its flight certification program. The structural qualification test, denoted as the sineburst test, subjected the spacecraft to a major overtest that resulted in significant structural damage to the spacecraft. The HESSI Test Mishap Investigation Board (MIB) was formed on March 24, 2000, in response to a NASA headquarters request. Board membership included experts from NASA and the University of California at Berkeley. This paper will present the investigation methods, findings, and lessons learned from the HESSI mishap.
Author
Imaging Techniques; Solar Energy; Spacecraft Structures; Vibration Tests; Spectroscopy

20010021103
Irradiation effects and mitigation. Proceedings of the IAEA Specialists Meeting. Working material
Dec. 31, 1997; 400p; In English; IAEA specialists meeting on irradiation effects and mitigation, 15-19 Sep. 1997, Vladimir, Russia
Report No.(s): DE99-603704; IWG-LMNPP-97/2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The IAEA Specialists Meeting on Irradiation Effects and Mitigation organized in co-operation with the Russian Research Centre 'Kurchatov Institute' was held at Vladimir, Russian Federation from 15 to 19 September 1997. Topics of the Meeting covered a number of problems including mechanisms of radiation damage, results of surveillance programmes and their analysis, effects of operating parameters, fracture mechanics tests and evaluation, annealing and optimisation of the process and reem-

brittlement after annealing. Specialists from 17 countries presented 31 paper, published in this proceedings each with a separate abstract.
NTIS
Irradiation; Conferences; Radiation Damage; Fracture Mechanics; Nuclear Power Plants

20010021338 Building and Construction Research TNO, Centre for Maritime Engineering, Delft, Netherlands
Design and Validation Methodology for Shock Exposed Composite Ship Structures, Volume 1 ***Final Report***
Meijer, G. J., Building and Construction Research TNO, Netherlands; Lemmen, P. P. M., Building and Construction Research TNO, Netherlands; Dec. 01, 2000; 44p; In English; Original contains color illustrations
Contract(s)/Grant(s): A95/KM/105; TNO Proj. 006.93313/01.01
Report No.(s): TD-2000-0375; TNO-2000-CMC-R086; Copyright; Avail: Issuing Activity

In the joint US NL project DYCOSS (dynamic behavior of composite ship structures), a design validation methodology has been developed for composite ship structures under UNDEX shock. The method comprises a balanced mix of experimental and analytical tools and procedures including a failure prediction too] implemented in an explicit general-purpose finite element program. The experiments include sunken box UNDEX tests and shock table tests. Together with a back calculation procedure, the experiments give realistic and accurate values of the failure parameters. A new numerical Failure Prediction Tool (FPT) is developed which provides a superior means to simulate the failure process compared with current available failure models. The project is co-sponsored by the US Office of Naval Research, the Netherlands Ministry of Defence, the Royal Netherlands Navy and TNO.
Author
Mechanical Shock; Vibration; Dynamic Characteristics; Composite Structures; Ships; Shock Tests; Vibration Tests

20010021364 Osaka City Univ., Faculty of Engineering, Japan
Elastic Buckling Behavior of Latticed Structures Under Member Lateral Load Instead of Nodal Load
Taniguchi, Yoshiya, Osaka City Univ., Japan; Saka, Toshitsugu, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 19-28; In English; Copyright; Avail: Issuing Activity

While the possibility of large space structural systems is pursued, it is important to study a new structural system as well as a new performance of materials. One of possible structural systems that have been developed is the hybrid system combining a space frame structure with a cladding, for example, a concrete slab, steel panels or membrane, In this case, constituent members of the structure are exposed to laterally distributed load due to the dead and live load. Then in this paper, the elastic buckling behavior of latticed structures is theoretically investigated on the condition that constituent members are subjected to laterally distributed load by using the proposed tangent stiffness equations of beam-column member. The treated latticed structures are double-layer latticed grids, cylindrical latticed shells and single-layer latticed domes.
Author
Elastic Buckling; Hybrid Structures; Structural Stability; Large Space Structures

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20010019979 Geological Survey, Water Resources Div., Indianapolis, IN USA
Evaluation of a Method of Estimating Low-Flow Frequencies from Base-Flow Measurements at Indiana Streams
Wilson, J. T.; 2000; 66p; In English
Report No.(s): PB2001-101963; USGS/WRI-00-4063; No Copyright; Avail: National Technical Information Service (NTIS)

A mathematical technique of estimating low-flow frequencies from base-flow measurements was evaluated by using a data for streams in Indiana. Low-flow frequencies at low-flow partial-record stations were estimated by relating base-flow measurements to concurrent daily flows at nearby streamflow-gaging stations (index stations) for which low-flow-frequency curves had been developed. A network of long-term streamflow-gaging station in Indiana provided a sample of sites with observed low-flow frequencies. Observed values of 7-day, 10-year low flow and 7-day, 2-year low flow were compared to predicted values to evaluate the accuracy of the method. Five test cases were used to evaluate the method under a variety of conditions in which the location of the index station and its drainage area varied relative to the partial-record station. A total of 141 pairs of streamflow-gaging stations were used in the five test cases. Four of the test cases used one index station, the fifth test case used two index stations.

The number of base-flow measurements was varied for each test case to see if the accuracy of the method was affected by the number of measurements used.
NTIS
Indiana; Estimating; Streams; Flow Measurement; Base Flow; Frequencies

20010019980 Bureau of Reclamation, Washington, DC USA
High Plains States Groundwater Demonstration Program. Program Summary Report, Part 3, Demonstration Project
Jun. 2000; 336p; In English; Original contains color illustrations
Report No.(s): PB2001-101888; No Copyright; Avail: National Technical Information Service (NTIS)

The High Plains States Groundwater Demonstration Program implemented demonstration recharge projects and associated studies to evaluate and advance groundwater recharge technology. The Bureau of Reclamation worked together with the Environmental Protection Agency (EPA), other Federal agencies, the Western States, water management organizations, consultants, contractors, and interest groups to carry out the provisions of the High Plains States Groundwater Demonstration Program Act of 1983. This part is a compilation of individual summary reports for each of the 14 demonstration recharge projects sponsored by the program. Project summary reports are based on more detailed full project reports that were prepared by the project sponsors upon completion of the demonstration project activities. Consequently, these summary reports provide a little more information than the project synopsis pages in Part 1; however, further information on specific projects is referred to in the full project reports and reference materials cited.
NTIS
Ground Water; Project Management; Plains

20010020402 Geological Survey, Reston, VA USA
Multiproxy Record of the Last Interglacial (MIS 5e) off Central and Northern California, USA, from Ocean Drilling Program Sites 1018 and 1020
Poore, R. Z., Geological Survey, USA; Dowsett, H. J., Geological Survey, USA; Barron, J. A., Geological Survey, USA; Heusser, L., Lamont-Doherty Geological Observatory, USA; Ravelo, A. C., Oregon State Univ., USA; 2000; 32p; In English
Report No.(s): PB2001-102195; USGS-PP-1632; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In this report, the authors present results of a multiproxy study of the record of the last interglacial contained in sediments recovered at Ocean Drilling Program (ODP) Sites 1018 and 1020 off central and northern California on the west coast of North America.
NTIS
Climate Change; Sediments; Drilling; Oceans; Upwelling Water

20010020404 Maryland Univ., Wye Research and Education Center, Queenstown, MD USA
Development of a Provisional Physical Habitat Index for Maryland Freshwater Streams *Final Report*
Hall, L. W.; Morgan, R. P.; Perry, E. S.; Waltz, A.; Oct. 1999; 152p; In English
Report No.(s): PB2001-102021; MANTA-EA-99-12; No Copyright; Avail: National Technical Information Service (NTIS)

The major objectives of this study were to: (1) use existing biological, chemical and physical habitat data from the 1994-97 Maryland Biological Stream Survey (MBSS) to determine the discriminatory power of physical habitat metrics for assessing the quality of non-tidal streams in Maryland and (2) develop a provisional multimetric Maryland Physical Habitat Index (MPHI) for both Coastal and Non-Coastal Plain stream strata using metrics that showed the best discriminatory power in reference and degraded conditions. Biological, chemical and land-use data were used to determine reference and impacted sites. In addition to the major objective described above, additional analyses were also conducted with the 1994-97 MBSS data to address the following: (1) compare MPHI, Fish Index of Biotic Integrity (IBI), Benthic IBI and stream characteristics; (2) determine the relationship of the herpetofauna presence data with physical habitat metrics; (3) compare the variability of the subjective physical habitat assessments by metrics among field crews (Appalachian Laboratory - AL; Wye Research and Education Center - WREC; and Department of Natural Resources - DNR) with the DNR Quality Control officer scores; (4) evaluate the relationship between land/use habitat metrics and instream continuous habitat metrics and (5) test the concept of habitat quantity (stream volume) and habitat quality (MPH) to characterize expectations for fish abundance, richness and IBI (quantity as well as quality of habitat will influence the number of fish).
NTIS
Fresh Water; Habitats; Streams; Maryland; Earth Resources

20010020710

International Conference: Analyses for Geology and Environment 1997

Dec. 31, 1997; 77p; In English; AFGE'97: international conference on analyses for geology and environment

Report No.(s): DE99-607953; INIS-SK-98-010; No Copyright; Avail: Department of Energy Information Bridge

In this proceedings About 60 people from Albania, Czech Republic, Germany, Poland, Russia and Slovakia took part in the conference. 71 reports had been presented. The conference made an essential contribution into development of analytical methods for geology and environment. Twenty papers deals with the monitoring of uranium, thorium, lead-210 in soils, minerals and environmental samples

NTIS

Emission; Emission Spectra; Conferences; Geology; Environment Management; Chronology; Lead Isotopes; Radioactive Isotopes

20010020931 Geological Survey, Water Resources Div., Tucson, AZ USA

Sediment Delivery by Ungaged Tributaries of the Colorado River in Grand Canyon, Arizona

Webb, Robert H., Geological Survey, USA; Griffiths, Peter G., Geological Survey, USA; Melis, Theodore S., Geological Survey, USA; Hartley, Daniel R., Geological Survey, USA; 2000; 78p; In English

Report No.(s): PB2001-102545; USGS/WRI-00-4055; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

The purpose of this report is to estimate the total sediment yield and sand delivery from ungaged tributaries in each of six reaches between Glen Canyon Dam and upper Lake Mead reservoir at the Grand Wash Cliffs. This inlcudes the entire drainage area between Glen Canyon Dam and upper Lake Mead reservoir except for the four largest tributaries. These estimates are based on an evaluation of both the debris-flow and streamflow components of sediment yield by multiple techniques. As a secondary objective, the authors evaluate the potential influence of climatic variability on sediment input in the light of historical climatic fluctuations. This study was funded in cooperation with the Bureau of Reclamation, as part of the Glen Canyon Environmental Studies Program, and the Grand Canyon Monitoring and Research Center.

NTIS

Colorado River (North America); Grand Canyon (Az); Sediments; Sands; Estimates; Sediment Transport

20010020933 Geological Survey, Water Resources Div., Carson City, NV USA

Water Budget Estimates for the 14 Hydrographic Areas in the Middle Humboldt River Basin, North-Central Nevada

Berger, David L., Geological Survey, USA; 2000; 66p; In English; Original contains color illustrations

Report No.(s): PB2001-102427; USGS/WRI-00-4168; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Water budgets were developed for the 14 hydrographic areas in the middle Humboldt River Basin of north-central Nevada. The water budgets include estimates of average annual precipitation, runoff, water yield, ground-water recharge and subsurface flow, and evapotranspiration (ET) determined from recently developed or revised methods. Ground-water pumping is not included in the budget estimates. The estimated budgets represent average annual volumes over a 30-year reference period (1961-90) and are compared to water budgets develop more than 30 years ago.

NTIS

Hydrology; Ground Water; Estimates; Hydrography

20010021101

Geological hazards investigation - relative slope stability map

Han, D. S.; Kim, W. Y.; Yu, I. H.; Kim, K. S.; Lee, S. R.; Dec. 31, 1997; 135p; In Korean; In English

Report No.(s): DE98-778543; KR-97-C-46; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Republic of Korea is a mountainous country; the mountains occupy about three quarters of her land area, an increasing urban development being taken place along the mountainside. For the reason, planners as well as developers and others must realize that some of the urban areas may be threaten by geologic hazards such as landslides and accelerated soil and rock creeps. For the purpose of environmental land-use planning, a mapping project on relative slope-stability was established in 1996. The selected area encompasses about 5, 900 km(exp 2) including the topographic maps of Ulsan, Yongchon, Kyongju, Pulguksa, and Kampo, all at a scale of 1:50,000. Many disturbed and undisturbed soil samples, which were collected from the ares of the landslides and unstable slopes, were tested for their physical properties and shear strength. They were classified as GC, SP, SC, SM, SP-SM, SC-SM, CL, ML, and MH according to the Unified Soil Classification System, their liquid limit and plasticity index ranging from 25.3% to as high as 81.3% and from 4.1% to 41.5%, respectively. X-ray analysis revealed that many of the soils contained a certain amount of montmorillonite. Based on the available information as well as both field and laboratory investigation, it was found out that the most common types of slope failures in the study area were both debris and mud flows induced by the heavy

rainfalls during the period of rainy season; the flows mostly occurred in the colluvial deposits at the middle and foot of mountains. Thus the deposits generally appear to be the most unstable slope forming materials in the study area. Produced for the study area were six different maps consisting of slope classification map, soil classification map, lineament density map, landslide distribution map, zonal map of rainfall, and geology map, most of them being stored as data base. Using the first four maps and GIS, two sheets of relative slope-stability maps were constructed, each at a scale of 1:100,000; the maps can be utilized for regional land-use planning.
NTIS
Hazards; Environment Management; Structural Properties (Geology)

20010021102
Fracture analysis for engineering geological utilization
Choi, H. I.; Choi, P. Y.; Hong, S. H.; Chi, K. H.; Kim, J. Y.; Dec. 31, 1997; 184p; In Korean; In English
Report No.(s): DE98-778545; KR-97-B-2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The problem of geological hazards (earthquakes) and water or thermal resources urges us to understand the regional tectonic setting or recent tectonics. The Uisong Subbasin is located in one of the seismicity zones in Korea. Because the reactivity of the Gaeum Fault System is an important problem focussing on these faults, we studied their whole extension and timing of faulting in terms of tectonics. Fault tectonic analysis is so effective as to easily reconstruct the tectonic sequence and each stress state at each site, eventually in a region. One can get insights for faulting timing in terms of the restored tectonic sequence, and discriminating the active faults or the faults active in the last (present) tectonics. Examining the filling materials in tension gashes, one can get raw knowledge regarding the thermal states at each site. For this study, we first analyzed the topographic textures (lineament, drainage and circular structures) on the relief map produced based on the topographic maps of 1:100,000 scale. Through investigations of susceptible area along the faults, their existence and movement modes were studied, and we can get information about movement history and whole extension of the faults belonging to the WNW-ESE trending Gaeum Fault System. In order to reconstruct the tectonic sequence, we measured fault slip data, tension gashes and dikes, from which fault populations were classified and stress (and thermal) states were determined. Seven compressional tectonic events and six extensional events were reconstructed. Because coaxial events partially coexisted, we bundled these events in one, finally we get seven tectonic events. Determining the types of minerals filling the tension gashes, we suggested the possibility of investigation of geothermal resources with less efforts.
NTIS
Fracturing; Geological Faults; Structural Properties (Geology)

20010021300 Bureau of Reclamation, Washington, DC USA
High Plains States Groundwater Demonstration Program: Program Summary Report, Part 1, Overview, Results and Findings
Jun. 2000; 180p; In English; Original contains color illustrations; See also PB2001-101888 Part 3
Report No.(s): PB2001-101887; No Copyright; Avail: National Technical Information Service (NTIS)

This is the final summary report for the High Plains States Groundwater Demonstration Program. This program consisted of 14 recharge demonstration projects and specialized investigations of groundwater recharge activities in the 17 Western States. The program was undertaken to obtain information from applied groundwater recharge demonstration projects to evaluate the potential role of recharge technology under a variety of physical, economic, and institutional circumstances. This report summarizes the program activities which emphasized practical experience to identify and evaluate factors that can influence the effective use of groundwater recharge in water resource planning.
NTIS
Ground Water; Water Resources; Hydrogeology

20010021369 Texas Technological Univ., Center for Multidisciplinary Research in Transportation, Lubbock, TX USA
Climatic Influence on NRCS Curve Numbers Literature Review
Thompson, D.; Oct. 2000; 32p; In English
Contract(s)/Grant(s): 0-2104
Report No.(s): PB2001-102680; Copyright; Avail: National Technical Information Service (NTIS)

The National Resources Conservation Service (NRCS) runoff curve number method provides the basis for much hydraulic design, including that performed by the Texas Department of Transportation (TXDOT). An index, the runoff curve number, is used to represent the runoff-producing potential of soils in a given watershed. In current TXDOT practice, curve numbers depend on characteristics of the watershed such as land use, soil group, and antecedent-moisture conditions. The basic index so derived

is modified for geographic location to include, theoretically, the sensitivity of the index to differences in climate. Furthermore, these curve numbers are assumed applicable for a wide range of additional design criteria such as drainage area precipitation duration, and precipitation intensity. Such assumptions have not been tested and there are considerable ramifications to the hydraulic design process if these assumptions do not hold. It hoped that several adjustments to standard curve numbers can be derived to account for the influence of the additional design criteria.
NTIS
Climatology; Earth Resources; Watersheds; Precipitation (Meteorology); Water Runoff; Least Squares Method

20010021371 Bureau of Reclamation, Technical Service Center, Denver, CO USA
Flood Frequency Determinations for the Lower Colorado River Review
Bullard, K. L.; Sep. 2000; 134p; In English
Report No.(s): PB2001-102664; Copyright; Avail: National Technical Information Service (NTIS)
Hydrologic analysis was done using more updated peak flow values for the tributary flows and an updated analysis for the main stem flows based on the most recent simulation studies for the Lower Colorado River. This report does not repeat the descriptions or details of the 1988 analysis.
NTIS
Colorado River (North America); Floods; Hydrology; Flow Measurement

20010021375 Geological Survey, Water Resources Div., Denver, CO USA
Hydrogeologic Characterization of Six Sites in Southeastern Minnesota Using Borehole Flowmeters and Other Geophysical Logs
Paillet, F. L., Geological Survey, USA; Lundy, James, Minnesota Pollution Control Agency, USA; Tipping, Robert, Minnesota Geological Survey, USA; Runkel, Anthony, Minnesota Geological Survey, USA; Reeves, Laurel, Minnesota Dept. of Natural Resources, USA; Green, Jeffrey, Minnesota Dept. of Natural Resources, USA; 2000; 46p; In English
Report No.(s): PB2001-102194; USGS/WRI-00-4142; Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Caliper, gamma, normal resistivity, fluid column temperature and resistivity, and televiewer logs were combined with borehole flow logs to infer the nature of water-producing intervals in six observation boreholes at sites in southeastern Minnesota. Flow profiles were obtained with either the electromagnetic or heat-pulse flowmeters, depending upon equipment availability at the time of logging. Gamma and resistivity logs were used to determine the stratigraphic position of open intervals in each of the boreholes. Water-producing intervals identified using the flowmeter logs were characterized as permeable coarse-clastic beds, solution openings along bedding planes, fractures, or karstic horizons on the basis of gamma, caliper, and televiewer logs. Flow log interpretation theory demonstrates that the hydraulic head and transmissivity of water-producing intervals intersecting an open borehole can be estimated if flow logs are obtained under two different quasi-steady conditions, and if the difference in open-borehole water level between the two conditions can be measured. If logistical conditions prevent flow logging under more than one condition, water-producing zones can be identified, but relative transmissivity values cannot be estimated.
NTIS
Hydrogeology; Boreholes; Flowmeters; Flow Theory; Geophysics

20010021544 Bureau of Reclamation, Technical Service Center, Denver, CO USA
Caballo Reservoir 1999 Sedimentation Survey *Final Report*
Collins, K.; Ferrari, R.; Nov. 2000; 76p; In English
Report No.(s): PB2001-102657; Copyright; Avail: National Technical Information Service (NTIS)
The Bureau of Reclamation (Reclamation) surveyed Caballo Reservoir in the spring and fall of 1999 to develop a topographic map and compute a present storage-elevation relationship (area-capacity tables). The underwater survey was conducted at reservoir elevation 4,146.8 feet (project datum is 43.3. feet less than NGVD29). The underwater survey used sonic depth recording equipment interfaced with a global positioning system (GPS) that gave continuous sounding positions throughout the underwater portions of the reservoir covered by the survey vessel. The reservoir covered by the survey vessel. The reservoir topography was determined by the importing digital images of the contour lines from the U.S. Geological Survey quadrangle (USGS quad) maps of the reservoir area. The new topographic map of Caballo Reservoir was developed from the combined 1999 underwater measured topography and the USGS quad contours. In October 1999, standard land surveying methods were used to measure portions of the range lines located above the reservoir water surface. As of April 1999, at reservoir water surface elevation (feet) 4,182.0, the surface area was 11,532 acres with a total capacity of 326,672 acre-feet. Since the reservoir's initial filling in 1938, 20,064

acre-feet of sediment have accumulated in Caballo Reservoir. Since the last reservoir survey in 1981, 4,838 acre-feet of sediment have been trapped. The average annual rate of sediment accumulation since 1938 is 327 acre-feet and since 1981 it is 265 acre-feet.
NTIS
Sediments; Reservoirs; Geological Surveys; Topography; Measuring Instruments

20010021546 Minnesota Univ., Dept. of Ecology, Evolution and Behavior, Saint Paul, MN USA
Establishment of Native Sedge Vegetation in Created Wetlands ***Final Report, 1994 - 1998***
Budelsky, R. A.; Cushing, E. J.; Galatowitsch, S. M.; Feb. 1999; 194p; In English
Report No.(s): PB2001-102630; Copyright; Avail: National Technical Information Service (NTIS)

This report presents the results of a four-year study on techniques for revegetation of native sedges in created basins. Although often the dominant genus in shallow wetlands, sedges (Carex spp.) do not readily recolonize after restoration or creation of the water table. It is unlikely that sedges will naturally establish in created wetlands. The results of seed germination studies on five Carex species suggest the highest germination rates in fresh seeds-with one exception. Wet/cold storage also can prolong seed viability for at least two-and-a-half years. Dry storage is not recommended for wetland sedge seeds. Short-term wet/cold treatment after prolonged dry storage does not improve germination rates. Sensitive to deep water, rising water levels, and competition during the establishment year, seedlings grew well across a wide range of water depths in subsequent growing seasons. Both species outcompeted annual weeds within two to three growing seasons, but not Phalaris arundinacea (reed canary grass). The study recommends weed control during the establishment year to prevent the invasion of P. arundinacea. Wetland soil promotes seedling growth relative to other soils, but does not affect germination rates. Because of the potential for the introduction of undesirable weeks, the study does not recommend the use of donor wetland soil. Instead, study results suggest the potential for the use of organic top-dressings.
NTIS
Vegetation; Wetlands; Environment Effects; Ecology

20010021666 Geological Survey, Water Resources Div., Lemoyne, PA USA
Techniques for Estimating Magnitude and Frequency of Peak Flows for Pennsylvania Streams
Stuckey, M. H.; Reed, L. A.; 2000; 56p; In English
Report No.(s): PB2001-102547; USGS/WRI-00-4189; Copyright; Avail: National Technical Information Service (NTIS)

Regression equations for estimating the magnitude and frequency of floods on ungaged streams in Pennsylvania with drainage areas less than, 2,000 square miles were developed on the basis of peak-flow data collected at 313 streamflow-gaging stations. All streamflow-gaging stations used in the development of the equations had 10 or more years of record and include active and discontinued continuous-record and crest-stage partial-record streamflow-gaging stations. Regional regression equations were developed for flood flows expected every 10, 25, 50, 100, and 500 years by the use of a weighted multiple linear regression model. The State was divided into two regions. The largest region, Region A, encompasses about 78 percent of Pennsylvania. The smaller region, Region B, includes only the northwestern part of the State. Basin characteristics used in the regression equations for Region A are drainage area, percentage of forest cover, percentage of urban development, percentage of basin underlain by carbonate bedrock, and percentage of basin controlled by lakes, swamps, and reservoirs.
NTIS
Estimating; Mathematical Models; Streams; Pennsylvania; Magnitude; Flood Predictions; Water Flow

20010021667 Geological Survey, Water Resources Div., Oklahoma City, OK USA
Reconnaissance of the Hydrology, Water Quality, and Sources of Bacterial and Nutrient Contamination in the Ozark Plateaus Aquifer System and Cave Springs Branch of Honey Creek, Delaware County, Oklahoma, ***Mar. 1999 - Mar. 2000***
Schlottmann, J. L.; Tanner, R.; 2000; 80p; In English
Report No.(s): PB2001-102546; USGS/WRI-00-4210; Copyright; Avail: National Technical Information Service (NTIS)

A reconnaissance investigation of hydrology and water quality was conducted to evaluate possible sources of bacteria and nutrient contamination in the Cave Springs Branch basin and the underlying karstic Ozark Plateau aquifer system. Objectives were to: (1) determine the directions of ground-water flow in the basin and determine whether Cave Springs Branch interacts with ground water, (2) compare water quality in Cave Springs Branch with water quality in nearby wells to determine whether the stream is contaminating nearby wells, and (3) determine sources of fecal coliform bacteria and nitrate contamination in Cave Springs Branch and ground water.
NTIS
Aquifers; Bacteria; Plateaus; Reconnaissance; Water Quality; Oklahoma; River Basins; Hydrology

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EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20010019833 Defense Science Board, Washington, DC USA
Report of the Defense Science Board Task Force on National Imagery and Mapping Agency ***Final Report***
Jones, Anita; Marino, Peter; Apr. 2000; 75p; In English
Report No.(s): AD-A385107; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

I am pleased to forward the final report of the Defense Science Board (DSB) Task Force on the National Imagery and Mapping Agency (NIMA). This effort, co-chaired by Dr. Anita Jones and Mr. Peter Marino was formed to review NIMA's objectives and plans and to determine whether the USA will continue to have superior imagery and geospatial information which national and military plans assume. This final report represents the collective view of the Task Force members on this very important topic. Continued dependency on superior information is a cornerstone of DoD plans for the future. Statements of strategic and tactical military concepts for the future, such as Joint Vision 2010, assume this foundation of information superiority. But the world is changing rapidly. In the past, American information superiority rested largely on the exclusivity of U.S. overhead collection assets. This exclusivity is eroding rapidly, as an increasing number of countries and commercial entities field imaging sensors aboard satellites and aircraft. Timely views of almost any point on earth are readily available for sale, and image resolution increases year by year.
DTIC
Imagery; Mapping

20010020021 NASA Marshall Space Flight Center, Huntsville, AL USA
Potential Pitfalls Related to Space-Based Lidar Remote Sensing of the Earth with an Emphasis on Wind Measurement
Kavaya, Michael J., NASA Marshall Space Flight Center, USA; Spiers, Gary D., Alabama Univ., USA; Frehlich, Rod G., Colorado Univ., USA; [2000]; 10p; In English; 2nd; Remote Sensing of the Atmosphere, Environment, and Space, 9-12 Oct. 2000, Sendai, Japan; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A collection of issues is discussed that are potential pitfalls, if handled incorrectly, for earth-orbiting lidar remote sensing instruments. These issues arise due to the long target ranges, high lidar-to-target relative velocities, low signal levels, use of laser scanners, and other unique aspects of using lasers in earth orbit. Consequences of misunderstanding these topics range from minor inconvenience to improper calibration to total failure. We will focus on wind measurement using coherent detection Doppler lidar, but many of the potential pitfalls apply also to noncoherent lidar wind measurement, and to measurement of parameters other than wind. Each area will be identified as to its applicability.
Author
Space Based Radar; Airborne Radar; Remote Sensing; Optical Radar; Optical Scanners

20010020178 Boston Univ., Dept. of Geography, Boston, MA USA
Collection of LAI and FPAR Data Over The Terra Core Sites ***Final Report, 1 Sep. 1999 - 31 Aug. 2000***
Myneni, Ranga B., Boston Univ., USA; Knjazihhin, J., Boston Univ., USA; Tian, Y., Boston Univ., USA; Wang, Y., Boston Univ., USA; Feb. 15, 2001; 7p; In English
Contract(s)/Grant(s): NAG5-8659; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of our effort was to collect and archive data on LAI (leaf area index) and FPAR (Fraction of Photosynthetically active Radiation absorbed by vegetation) at the EOS Core validation sites as well as to validate and evaluate global fields of LAI and FPAR derived from atmospherically corrected MODIS (Moderate Resolution Imaging Spectrometer) surface reflectance data by comparing these fields with the EOS Core validation data set. The above has been accomplished by: (a) the participation in selected field campaigns within the EOS Validation Program; (b) the processing of the collected data so that suitable comparison between field measurements and the MODIS LAI/FPAR fields can be made; (c) the comparison of the MODAS LAI/FRAM fields with the EOS Terra Core validation data set.
Derived from text
Data Acquisition; Leaf Area Index; Vegetation

20010020408 University of South Florida, Dept. of Marine Science, Saint Petersburg, FL USA

Remote Sensing Study of Upwelling in the Northeastern Gulf of Mexico and the Effects of Hurricanes Earl and Georges (Year 2) ***Annual Report***

Muller-Karger, Frank E., University of South Florida, USA; Vukovich, Fred, Science Applications International Corp., USA; Nababan, Bisman, University of South Florida, USA; Hu, Chuanmin, University of South Florida, USA; Myhe, Doug, University of South Florida, USA; May 2000; 64p; In English

Contract(s)/Grant(s): 1435-01-97-CA-30857

Report No.(s): PB2001-101755; MMS-2000-028; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Flow-through and satellite data documented that freshwater from the Mississippi River spread eastward in the summers of both 1998 and 1999 as indicated by low salinity, high chlorophyll-a concentration and high colored dissolved organic matter. The eastward entrainment of this river plume was facilitated by the presence of an anticyclonic eddy located south of the Desoto Canyon area. In Spring and Winter, however, there is no significant eastward entrainment of the Mississippi River water. Unusual upwelling was found along the coasts of the Florida Panhandle in the northeastern Gulf of Mexico in May-July 1998 which led to 3-5 C lower sea surface temperature (SST) than is normal. Concurrently with the anomalous SST, substantial volumes of turbid Mississippi River water spread east of the Delta along the coast. Distinct upwellings after the hurricane Earl and Georges were found at the shelf break over the Northeastern of the Gulf of Mexico. The SST decreased by as much as 3.6 C for Earl and 4.2 C for Georges. In the case of Georges, SeaWiFS detected a double increase of pigment concentration at the lowest SST location.. NTIS

Remote Sensing; Gulf of Mexico; Upwelling Water; Fresh Water; Rivers; Hurricanes

20010020800 Canadian Wildlife Service, North American Wetlands Conservation Council, Ottawa, Ontario Canada

North American Wetlands Conservation Act Progress Report, 1998-1999

2000; 40p; In English

Report No.(s): PB2001-101488; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This report includes: (1) a biennial assessment of: (a) the estimated number of acres of wetlands and habitat for waterfowl and other migratory birds that were restored, protected, or enhanced during such two-year period by Federal, State, and local agencies and other entities in the US, Canada, and Mexico; (b) trends in the populations size and distribution of North American migratory birds; (c) the status of efforts to establish agreements with nations in the western hemisphere; and (d) wetlands conservation projects funded under this act, listed and identified by type, conservation mechanism, location, and duration; and (2) an annual assessment of the status of wetlands conservation projects, including an accounting of expeditures by Federal, State, and other US entities, and expenditures by Canadian and Mexican sources to carry out these projects.

Author

Conservation; Habitats; Populations; Trends; Wetlands

20010020934 LGL Alaska Research Associates, Inc., Anchorage, AK USA

Mapping Cook Inlet Rip Tides Using Local Knowledge and Remote Sensing. Environmental Studies Program ***Final Report, Jul. 1997 - Sep. 00***

Haley, Beth, LGL Alaska Research Associates, Inc., USA; Tomlins, Geoff, Pacific Geomatics Ltd., Canada; Smith, Orson, Alaska Univ., USA; Wilson, William, LGL Alaska Research Associates, Inc., USA; Link, Michael, LGL Alaska Research Associates, Inc., USA; Sep. 01, 2000; 80p; In English

Contract(s)/Grant(s): 01-98-CT-30906

Report No.(s): PB2001-102426; MMS-2000-025; Copyright; Avail: National Technical Information Service (NTIS)

In 1999, local knowledge and satellite imagery information was gathered to map Cook Inlet rip tides. Local knowledge was obtained from fishermen concerning the location, consistency and use of rip tides within Cook Inlet. The locations of rip tides were also interpreted from and mapped using satellite-borne Synthetic Aperture Radar (SAR) imagery. During the summer of 1999, the Canadian Space Agency's RADARSAT 1 satellite was programmed to image the study area during commercial gillnet openers in Cook Inlet. As the satellite collected image data, local fishermen simultaneously recorded their location and distance from a rip tide to test the ability of satellite radar imagers to interpret rip tide locations in the image. Historic radar imagery collected by the European Radar Satellites (ERS-1 and ERS-2) between 1992 and 1999 were also examined to determine the consistency of Cook Inlet rip tide locations at different tide stages among years. Several rip tides consistently appear along the longitudinal axis of lower Cook Inlet. A west rip tide and a combined middle and east rip tide were noticeable on the SAR images

analyzed. Fishermen verified the persistent presence of these rip tides, and reported that they often fish along rip tides where salmon may concentrate.
NTIS
Remote Sensing; Satellite Imagery; Radar Imagery; Mapping; Tides; Cook Inlet (AK); Tidal Waves; Satellite-Borne Radar

20010021179 NASA Marshall Space Flight Center, Huntsville, AL USA
Intercomparison of GOES-8 Imager and Sounder Land Surface Temperature Retrievals
Suggs, Ronnie J., NASA Marshall Space Flight Center, USA; Lapenta, William, NASA Marshall Space Flight Center, USA; Jedlovec, Gary J., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 11th; Meteorological Observations and Instrumentation, 14-19 Jan. 2001, Albuquerque, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Recent studies at the Global Hydrology and Climate Center (GHCC) have shown that the assimilation of land skin temperature (LST) tendencies into a mesoscale model can significantly improve short term forecasts of near surface temperature and moisture. The high spatial and temporal resolution of GOES derived land surface products provide valuable information about the spatial and temporal variability of the land surface forcing simulated in the model. In the GHCC studies LST was derived using a split window technique requiring at least two longwave infrared window channels and thus, utilized the 11 and 12 micron channels found on the GOES-8 Imager with a nadir spatial resolution of 4km. However, beginning with the launch of GOES-M (scheduled for mid 2001) and subsequent satellites the 12 micron channel will be removed from the Imager leaving only one longwave window channel. The GOES Sounder will continue to have more than one longwave infrared window channel (including a 12 micron channel) but, with a spatial resolution of 10 km nadir. LST retrievals from the newer GOES satellites will thus be derived from Sounder measurements at a reduced spatial resolution. This paper intercompares the LST retrievals from the GOES-8 Imager and Sounder. The effects on the LST retrievals due to the Sounder's reduced resolution from that of the Imager and its different longwave infrared channel characteristics are examined. The effects of transitioning from Imager to Sounder LST products on the results from model assimilation of these products are also examined.
Author
GOES Satellites; Land Surface Temperature; Comparison; Satellite Sounding

20010021208 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
The Design and Development of an Internet-Based Graphical User Interface Using a Commercial Design Tool and Java
Myrick, Stephanie A.; Gendron, Marlin L.; Lohrenz, Maura C.; Edwards, Stephanie S.; Oct. 26, 2000; 7p; In English; Pub. in Proceedings of Southern Conference on Computing, University of Southern Mississippi, Hattiesburg, MS 26-28 Oct 2000.
Report No.(s): AD-A385436; NRL/PP/7440-00-1010; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes the design and development of an Internet-hosted Graphical User Interface (GUI) to plan digital aeronautical chart coverages for cockpit moving-map displays by U.S. military aircraft mission planners, requirements officers, and aircrew. The GUI is a component of the Moving-Map Composer (MMC) software that has been developed by the Naval Research Laboratory at the Stennis Space Center (NRLSSC). MMC performs a wide variety of naval mission planning systems and in-flight moving-map displays.
DTIC
Charts; Cockpits; Display Devices; Graphical User Interface; Internets; Maps; Computer Programs; Java (Programming Language)

20010021232 Naval Research Lab., Bay Saint Louis, MS USA
Characterization of the Dynamic Littoral Zone: An Exercise in the Real-Time Dynamics of Spatial Data Integration
Breckenridge, John; Shaw, Kevin; Ladner, Roy; Wilson, Ruth; Holland, K. T.; Nov. 16, 2000; 14p; In English
Report No.(s): AD-A385578; NRL/PP/7440--00-1013; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The National Imagery and Mapping Agency (NIMA) has established 'Phase I Proof-of-Concept Demonstration for an Integrated Interagency Characterization of the Littoral Zone' under the program direction of Chung Hye Read. The purpose of this task was to examine and demonstrate advanced spatial database techniques that allow for the efficient and timely integration of large spatial databases relative to Littoral 'Areas of Interest (AOI)'. to accomplish this effort, the Naval Research Laboratory's Digital Mapping, Charting & Geodesy Analysis Program (DMAP) expanded its Geospatial Information Database (GIDB), an object-oriented database system, to handle the Littoral-zone dynamics which tend to be highly variable in both the temporal and spatial domains. GIDB stores this data with large quantities of topographic, navigational, and cultural features data, to offer a high-resolution digital representation of both wet and dry environments within the coastal regions.
DTIC
Real Time Operation; Data Integration; Data Bases; Geographic Information Systems

20010021263 NASA Marshall Space Flight Center, Huntsville, AL USA

The Ancient Maya Landscape from Space

Sever, T., NASA Marshall Space Flight Center, USA; [1999]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The Peten, once inhabited by a population of several million before the collapse of the ancient Maya in the 10th and 11th centuries, is being repopulated toward its former demographic peak. Environmental dynamics, however, impose severe constraints to further development. Current practices in subsistence, commercial agriculture, and cattle raising are causing rapid deforestation resulting in the destruction of environmental and archeological resources. The use of remote sensing and Geographic Information Systems (GIS) technology is a cost-effective methodology for addressing issues in Maya archeology as well as monitoring the environmental impacts being experienced by the current population.

Author

Remote Sensing; Terrain; Tropical Regions; Forests

20010021303 Raytheon Information Technology and Scientific Services, Sioux Falls, SD USA

Implementation Strategy for Production of National Land-Cover Data (NLCD) from the LANDSAT 7 Thematic Mapper Satellite

Vogelmann, J. E.; Wickham, J. D.; Feb. 2000; 44p; In English

Report No.(s): PB2001-101756; EPA/600/R00-051; No Copyright; Avail: Defense Technical Information Center (DTIC)

As environmental programs within and outside the federal government continue to move away from point-based studies to larger and larger spatial (not cartographic) scale, the need for land-cover and other geographic data have become ineluctable. The national land-cover mapping project of MRLC marks the first consistently classified conterminous land-cover data set, effectively replacing USGS' Land Use Data Analysis (LUDA) system derived from high altitidue aerial photography acquired in the early 1970's. Because of the continually changing nature of the earth's surface due to anthropogenic activities and other factors, a single point-in-time land-cover product is insufficient for many applications. Production of a second point-in-time land-cover product is proposed as a database. That proposed database design includes: (1) second, independently classified land-cover data set derived from LANDSAT 7 Thematic Mapper data; (2) the land-cover product being produced under the current effort, (3) selected spectral-based change estimates (e.g., temporal NDVI), (4) thirty-meter DEMS; and (5) selected landscape metrics. Development of the database for the conterminous USA will start after evaluation of the prototype.

NTIS

Aerial Photography; Land Use; Geological Surveys; Remote Sensing; Mapping; Resources Management

20010021362 Osaka City Univ., Faculty of Engineering, Japan

Effects of Improving Recycled Fine Aggregate by Ball Mill

Fumoto, Takayuki, Osaka City Univ., Japan; Imose, Yoshihiko, Osaka City Univ., Japan; Yamada, Masaru, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 65-72; In English; Copyright; Avail: Issuing Activity

The recycle fine aggregate is not much used for a concrete material, because of its low quality. In order to improve its quality, therefore, both a ball mill refinement and a mixing with an ordinary fine aggregate have been conducted. The effect of each improvement and the influence of the recycled fine aggregate strength are discussed based upon the obtain relation between the recycled fine aggregate quality and the mortar properties used the aggregate. As a result, the ball mill treatment could draw its shape improvement to some degree. The recycled fine aggregate strength could, moreover, hardly affect recycled aggregate mortar properties.

Author

Recycling; Aggregates; Mortars (Material)

20010021363 Osaka City Univ., Faculty of Engineering, Japan

An Analysis Between the Ground Surface Temperature and Land Use in Urban Area by Using LANDSAT-TM Data

Ishimaru, Hiroshi, Osaka City Univ., Japan; Nishimura, Takashi, Osaka City Univ., Japan; Yamamoto, Katsuhiko, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 57-63; In English; Copyright; Avail: Issuing Activity

The outline of the artificial satellite LANDSAT-TM data was described at first, and the relations between the ground surface temperature and land use were analyzed by using it. Available data were the morning (10 a.m.) and evening (9 p.m.) data in Osaka are in 6 days in total in the recent separated years from 1990 to 1998 due to the weather condition.

Author

Land Surface Temperature; Land Use

20010021600 NASA Marshall Space Flight Center, Huntsville, AL USA

Remote Sensing of Atlanta's Urban Sprawl and the Distribution of Land Cover and Surface Temperatures

Laymon, Charles A., Universities Space Research Association, USA; Estes, Maurice G., Jr., Universities Space Research Association, USA; Quattrochi, Dale A., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 2001 Association of American Geographers Annual Meeting, 27 Feb. - 3 Mar. 2001, New York City, NY, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Between 1973 and 1992, an average of 20 ha of forest was lost each day to urban expansion of Atlanta, Georgia. Urban surfaces have very different thermal properties than natural surfaces-storing solar energy throughout the day and continuing to release it as sensible heat well after sunset. The resulting heat island effect serves as catalysts for chemical reactions from vehicular exhaust and industrialization leading to a deterioration in air quality. In this study, high spatial resolution multispectral remote sensing data has been used to characterize the type, thermal properties, and distribution of land surface materials throughout the Atlanta metropolitan area. Ten-meter data were acquired with the Advanced Thermal and Land Applications Sensor (ATLAS) on May 11 and 12, 1997. ATLAS is a 15-channel multispectral scanner that incorporates the LANDSAT TM bands with additional bands in the middle reflective infrared and thermal infrared range. The high spatial resolution permitted discrimination of discrete surface types (e.g., concrete, asphalt), individual structures (e.g., buildings, houses) and their associated thermal characteristics. There is a strong temperature contrast between vegetation and anthropomorphic features. Vegetation has a modal temperature at about 20 C, whereas asphalt shingles, pavement, and buildings have a modal temperature of about 39 C. Broad-leaf vegetation classes are indistinguishable on a thermal basis alone. There is slightly more variability (plus or minus 5 C) among the urban surfaces. Grasses, mixed vegetation and mixed urban surfaces are intermediate in temperature and are characterized by broader temperature distributions with modes of about 29 C. Thermal maps serve as a basis for understanding the distribution of "hotspots", i.e., how landscape features and urban fabric contribute the most heat to the lower atmosphere.

Author

Remote Sensing; Atlanta (Ga); Urban Development; Land Surface Temperature; Thermal Mapping

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

20010019853 McMullen (John J.) Associates, Inc., Alexandria, VA USA

Comparative Life Cycle Costs of Fuel Cells and Other Propulsion Systems ***Final Report***

Karni, Z.; Willigan, R.; Artze, C.; Badal, M.; Gordon, W.; Jan. 2000; 73p; In English

Contract(s)/Grant(s): DTCG39-95-D-E99010

Report No.(s): AD-A385105; R/DC-310-99; USCG-D-19-00; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This is a report on the development of a Life Cycle Cost (LCC) model that compares costs for traditional propulsion systems to costs of marine propulsion systems that incorporate fuel cells. The Coast Guard is interested in applying fuel cell technology for shipboard applications where high efficiency and reduced pollution are critical. Similar cost comparisons are also made for ship service generators. The program sums acquisition costs of the machinery system of a vessel, the operational costs including fuel and maintenance, manning costs and disposal costs. An allowance for exhaust emission credits/penalties is included in the program. The description of the program and of all the major assumptions leading to the present and future cost figures is provided in this report. The Excel software used for this study is available from the technical point of contact listed above. A comparison of Life Cycle Costs for four marine propulsion systems is presented. A conventional diesel only system (CODAD) was compared to an Integrated Diesel Electric system (IDE) and then to the new powering systems, i.e., the Molten Carbonate (MC) and the Proton Exchange Membrane (PEM) fuel cell systems. The fuel cell models contained in this report are preliminary, as no historical shipboard data are yet available. Nonetheless, best estimates have been made, and all key variables can be altered to investigate sensitivity. This LCC model is expected to be refined as more accurate data, particularly with respect to fuel cells, becomes available.

DTIC

Life Cycle Costs; Cost Analysis; Costs; Systems Engineering; Propulsion System Configurations; Marine Propulsion

20010019996 NASA Marshall Space Flight Center, Huntsville, AL USA

Overview of NASA's Space Solar Power Technology Advanced Research and Development Program

Howell, Joe, NASA Marshall Space Flight Center, USA; Mankins, John C., NASA, USA; [2001]; 1p; In English; 52nd; International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

Large solar power satellite (SPS) systems that might provide base load power into terrestrial markets were examined extensively in the 1970s by the US Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA). Following a hiatus of about 15 years, the subject of space solar power (SSP) was reexamined by NASA from 1995-1997 in the 'fresh look' study, and during 1998 in an SSP 'concept definition study', and during 1999-2000 in the SSP Exploratory Research and Technology (SERT) program. As a result of these efforts, during 2001, NASA has initiated the SSP Technology Advanced Research and Development (STAR-Dev) program based on informed decisions. The goal of the STAR-Dev program is to conduct preliminary strategic technology research and development to enable large, multi-megawatt to gigawatt-class space solar power (SSP) systems and wireless power transmission (WPT) for government missions and commercial markets (in-space and terrestrial). Specific objectives include: (1) Release a NASA Research Announcement (NRA) for SSP Projects; (2) Conduct systems studies; (3) Develop Component Technologies; (4) Develop Ground and Flight demonstration systems; and (5) Assess and/or Initiate Partnerships. Accomplishing these objectives will allow informed future decisions regarding further SSP and related research and development investments by both NASA management and prospective external partners. In particular, accomplishing these objectives will also guide further definition of SSP and related technology roadmaps including performance objectives, resources and schedules; including 'multi-purpose' applications (commercial, science, and other government).

Author

Research and Development; Solar Power Satellites; Spacecraft Power Supplies

20010020070 NASA Marshall Space Flight Center, Huntsville, AL USA

Construction of Power Receiving Rectenna Using Mars- In-Situ Materials; A Low Energy Materials Processing Approach

Curreri, Peter A., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 52nd; Energy-Rich Approaches to Human Exploration of Mars and Beyond: Potential Applications of Innovative Space Power Concepts and Technologies, 1-5 Oct. 2001, Toulouse, France; Sponsored by International Astronautical Congress, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

It is highly desirable to have a non-nuclear power rich option for the human exploration of Mars. Utilizing a Solar Electric Propulsion, SEP, / Power Beaming architecture for a non-nuclear power option for a human Mars base potentially avoids the weather and dust sensitivities of the surface photovoltaic option. Further from Mars areosynchronous orbit near year round power can be provided. Mission analysis, however, concludes that ultra high (245 GHz) frequencies or laser transmission technologies are required for Mars landed mass competitiveness with the surface photovoltaic option if the receiving rectifying antenna "rectenna" is transported from Earth. It is suggested in this paper that producing rectenna in situ on Mars surface might make a more conventional 5.8 GHz system competitive with surface PV. The premium of a competitive, robust, continuous base power might make the development of a 10 plus MWe class SEP for human Mars mission a more attractive non-nuclear option.

Author

Mars Missions; Rectennas; Solar Electric Propulsion; Power Beaming

20010020709

Feasibility study on the introduction of hybrid energy utilization-type systems to houses in snowy and cold regions, *FY 1997*

Mar. 31, 1998; 123p; In Japanese

Report No.(s): DE99-707581; NEDO-P-9707; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This research relates to hybrid energy (HE) utilization-type systems which make the most of new energy such as photovoltaic power generation and solar heat, and untapped energy such as household wastewater. The purpose of the research was to construct a model which is considered to be the most suitable system for introduction to houses and public facilities in snowy and cold regions. This is achieved by examining detailed energy balance of demand and supply, utilization of passive energy and of thermal storage systems, and cost required for maintaining facilities and operating expenses, and also by assessing the durability, operation, comfortability, and degree of contribution to reducing environmental loads of systems. Considering detached wooden houses constructed by conventional methods in Sapporo, three types of models were built, i.e., comparison standard houses, popular HE utilization-type houses, and future HE utilization-type houses. Energy consumption and reduced environmental loads were evaluated for each model. As a result, the construction cost of the popular-type model was estimated to be 20 to 25% higher than that of the comparison standard model, while energy self- sufficiency increased to approximately 40% and the amount of carbon diox-

ide emission decreased by approximately 47 to 49%. For the future-type model, energy self-sufficiency reached 100% without carbon dioxide emission.
NTIS
Energy Conservation; Energy Consumption; Solar Generators; Solar Collectors; Solar Dynamic Power Systems; Heat Storage

20010020810

International research cooperation in fiscal 1997: Report on the research, development, and evaluation of environmentally-friendly combustion technologies

Mar. 31, 1998; 134p; In Japanese
Report No.(s): DE99-714265; ETDE/JP-99714265; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Concerning the research and development of environmentally-friendly combustion technologies that had been conducted for six years beginning in 1992, analysis and discussion were made by a special committee dedicated to the evaluation of the efforts, and the outcome is stated. In the study of zeolite-base catalysts, a highly active catalyst was developed which assumes a multilayer structure of mordenite, etc., with titanium introduced thereinto using an NO-selective reducing catalyst. As for metal complex oxide-base catalysts, various catalysts high in activity were developed, based on saponite which is a laminar, clayey compound. As for alumina-base catalysts, details were learned of the reaction mechanism and catalysis activation sites and, helped by the findings, a silver-supporting alumina catalyst was produced. In the study of direct decomposition type NOx removing catalysts, a success was achieved in causing NO to be decomposed with high selectivity in an oxygen atmosphere by use of new-type electrodes, functional layers, and solid electrolytes. In the field of catalytic combustion, a PdO-Pt/Ba-Al2O3 catalyst was developed, which is to serve for a hybrid type catalytic combustion method.
NTIS
Combustion; Catalysts; Combustion Chambers; Hybrid Propellant Rocket Engines; Metal Oxides

20010020811

Research report of fiscal 1997: Invitation project of specialists on petroleum substituting energy between Japan and the EU

Mar. 31, 1998; 86p; In Japanese
Report No.(s): DE99-714249; NEDO-P-9760; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Specialists were invited from EU countries for information exchange to promote R and D of petroleum substituting energy in Japan. In the seminar on the present and future trend of R and D of fuel cells in EU countries, the present R and D state of fuel cells in Italy, the present state and future R and D plan of fuel cells in ANSALDO group, the state of SOFC R and D in Germany and by international cooperation, and R and D of polymer electrolyte fuel cell in Fraunhofer institute for Solar Energy Systems were reported contributing to mutual understanding between Japan and the EU. Exchange of opinions and information was also made between 4 fuel cell specialists of EU countries and Japanese specialists. The report on such an exchange includes the outline of Japanese fuel cell technologies, and the present R and D states of phosphoric acid fuel cell (PAFC), molten carbonate fuel cell (MCFC), solid oxide fuel cell (SOFC), and polymer electrolyte fuel cell (PEFC). The specialists visited some government organizations, semi-government organizations, institutes and private enterprises related to promotion, support and verification of R and D of fuel cells.
NTIS
Fuel Cells; Crude Oil; Energy Technology; Europe; Japan; Conferences; Substitutes

20010020838

Research report of fiscal 1997: Survey on creation of high-efficiency renewable resources, and bioconversion technology

Mar. 31, 1997; 263p; In Japanese
Report No.(s): DE99-714230; NEDO-GET-9713; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Survey was made on material production technology using creation technology of high-efficiency renewable resources (photosynthesis reaction of plants). Industrially usable plant resources in overseas countries and Japan were arranged, and plant resources unused for food were also surveyed. The present state of genetic engineering necessary for metabolic engineering of higher plants such as fit and high-expression technology of genes, plant cell cultivation, and control technology of plant cell multiplication is described, and elementary technologies required for future gene-recombined plants are predicted. Survey was also made on the trend of creation technology of industrial plants for fat and oil, biodegradable polyester, amino acid, cellulose, fiber (cotton) and forest wood. A patent list on plant biotechnology was prepared, and study on bioconversion of plant resources was

also surveyed. Overseas R & D trends on conversion and effective use technologies of renewable bio- resources are reported, and process design and its profitability were evaluated through a case study.
NTIS
Renewable Energy; Biotechnology; Bioconversion; Photosynthesis; Genetic Engineering; Growth

20010020857 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Evaluation of Photovoltaic Panels at the South Pole Station
Williams, Christopher R., Army Cold Regions Research and Engineering Lab., USA; Rand, John, Army Cold Regions Research and Engineering Lab., USA; April 2000; 23p; In English
Report No.(s): AD-A378459; ERDC/CRREL-TR-00-4; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

For this study, commercially available photovoltaic (PV) panels of similar mechanical and electrical characteristics were procured from four manufacturers, and their structural survivability and electrical performance were evaluated in the extreme harsh environment of the South Pole, on the rooftop of the newly constructed Atmospheric Research Observatory (ARO). The PV panels were installed for 410 days. During that time, they were exposed to varying amounts of inclement weather. Temperatures ranged from a low of -70 to a high of -20 C, with average wind speeds of approximately 5 meters per second, gusting to 20 meters per second. Prior to removal, each PV panel was inspected to see if the harsh environment degraded the structural characteristics of the panel frame, glazing, panel backing, and junction box. The inspection showed that the PV panels had not noticeably degraded during the 410-day exposure. The electrical performance of the PV panels depended on two factors: sun angle and visibility. On days with cloud cover or windblown snow, the PV panels' output power was reduced significantly. With sun angles approaching the highest limits and visibility being high, the PV panels approached their rated output power.
DTIC
Polar Regions; Solar Energy; Photovoltaic Cells; Panels; Southern Hemisphere

20010020861 JX Crystals, Inc., Issaquah, WA USA
Metal Silicide Matched Emitters for Use in the Thermophotovoltaic Generators ***Final Report***
Avery, James E., JX Crystals, Inc., USA; Fraas, Lewis M., JX Crystals, Inc., USA; May 22, 2000; 16p; In English
Contract(s)/Grant(s): DAAD19-99-C-0034
Report No.(s): AD-A379018; ARO-40162.1-CH; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This contract addressed the issue of the spectral selectivity of emitters in thermophotovoltaic electric generators. In these systems, a fuel is burned to heat an emitter, which radiates energy to photovoltaic cells. One critical factor in overall system efficiency and output power is the percentage of radiant energy within the band of the photovoltaic cells. This contract investigated various emitter coatings in order to maximize radiant energy within the band of the photovoltaic cells being used, while minimizing the out-of-band energy. An appropriate coating sequence has been identified and successfully tested. The goal was to tune the spectrum for gallium antimonide photovoltaic cells, because these cells respond to longer wavelengths than traditional photovoltaic cells, and because these cells are practical to manufacture. of the refractory metals investigated, tungsten proved to be the most stable. With an anti-reflective coating over the tungsten, the spectrum can be finely tuned for the 1.8 micron band-edge of gallium antimonide cells.
DTIC
Electric Generators; Emitters; Photovoltaic Cells; Silicides; Refractory Metals; Thermal Energy

20010021024
Admittance spectroscopy investigations of the a-Si:H/c-Si heterojunction with a view to applications in photovoltaic energy conversion
Gall, S.; Dec. 31, 1997; 154p; In German; In English
Report No.(s): DE99-712817; HMI-B-549; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

a-Si:H/c-Si heterojunctions in solar cells were investigated by admittance spectroscopy, which is able to observe defects at the a-Si:H/c-Si interface. The reasons for the investigation are stated in chapter 2. Chapter 3 describes the main characteristics of the materials involved, while chapter 4 discusses the heterojunction between the materials. Chapter 5 describes Schottky contacts on a-Si:H that were used in this investigation for investigating the heterojunction. Chapter 6 describes the preparation of specimens and chapter 7 their characterisation. Chapter 8 describes the investigations by admittance spectroscopy. Apart from the results of the measurements and simulations, also the method of measurement, the measuring set-up and the fundamentals are presented. Photovoltaic characteristics of the junctions are presented in chapter 9. The report ends with a summary.
NTIS
Electrical Impedance; Spectroscopy; Solar Cells; Photovoltaic Cells; Amorphous Silicon

20010021078

Data book on new energy technology development in FY 1997: Photovoltaic (PV) power generation

Mar. 31, 1998; 279p; In Japanese

Report No.(s): DE99-707582; NEDO-P-9709; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

For the purpose of understanding the present status of photovoltaic power system (PVPS) and supporting its promotion, various data were collected. The significance of adopting PV power technology was specified for customers of various levels, such as nation, local communities, industries and individual households, to clarify the CO2 reduction effect and energy pay-back time. Data illustrate the solar cell production according to region, cell types, industries, applications, production value, and market price. Policies for PVPS in industrial countries were compared with those in Japan. Distribution of PVPS in various countries was compared with that in Japan in respect to installations and purposes of the introduction of PVPS. Financial aid programs such as subsidies, tax benefits and loans for the installation of PVPS in Japan were listed. The trend of PV-related budget of MITI was shown with every project's description. Steps of introducing PVPS from plan to installation were depicted in the form of flow chart. Were shown measures sponsored by the government or local organizations to promote PVPS. Domestic and foreign firms related to PVPS including PV module suppliers, and PV installation contractors were listed.

NTIS

Energy Technology; Photovoltaic Conversion; Solar Cells; Solar Generators; Electric Generators

20010021079

Data book on new energy technology development in FY 1997: Installations of photovoltaic (PV) power generation

Mar. 31, 1998; 291p; In Japanese

Report No.(s): DE99-707583; NEDO-P-9710; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The present survey places particular emphasis on the field of PV power generation systems, and intends to collect data on solar cell application products and PV power generation system installation cases, to classify them according to their usage and to compile a collection of case records including photographs. For the data collection, two formats have been adopted. A format for the solar cell-based products includes a picture of the product, and information on solar cell output and commercialization status. Another format for the installation of PV power systems includes a picture of the installation, and information on location, output level, system type, PV module type, owner, and date of installation. The application of solar cells was classified into 14 fields, i.e., consumer appliances, road and traffic, railroad, general industries, housing related, automobiles, agriculture, ocean development, disaster prevention and safety, amenity, developing countries, buildings, public facilities, and environment. A total of 241 valid cases have been collected. Overseas products and installation cases are often characterized by new applications and innovative design, and contain a lot of useful suggestions for promoting the spread of PV technology in Japan.

NTIS

Energy Technology; Photovoltaic Conversion; Solar Cells; Solar Generators; Electric Generators

20010021080

Data book on new energy technology in FY 1997: Wind power generation

Mar. 31, 1998; 170p; In Japanese

Report No.(s): DE99-707584; NEDO-P-9711; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

It is an urgent necessity for Japan to promote the technological development and accelerate the introduction and diffusion of new energy. In order to diffuse and enlighten the introduction of new energy technology efficiently, it is necessary to compile various information regarding new energy in a comprehensive and systematic way, and formulate a database. Aiming at the systematic formulation of data on new energy, this survey focuses on the field of wind power generation system (WPS) and provides a collection of the latest published data on WPS, particularly regarding the worldwide installed wind power capacity, support plan and government policies, current situations of WPS market, and major technical characteristics of typical wind turbines. This report consists of the significance of wind energy, world market of wind turbines, government policies, international wind energy development, subsidies for wind energy, procedures of wind turbine system installation, governmental measures for wind energy development, subsidiary companies and organizations, basis of wind energy, and Japan's wind energy development in 1997.

NTIS

Energy Technology; Windpower Utilization; Wind Turbines; Windpowered Generators; Electric Power Plants; Energy Policy

20010021096

Data book on new energy technology development in FY 1997. Cogeneration

Mar. 31, 1998; 128p; In Japanese; In English

Report No.(s): DE99-707585; NEDO-P-9712; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Various policies are being implemented in the field of new energy technology in line with progress in technological development. Examples are about assistance mechanism, field test projects and advisory projects to support the introduction of new energy technology. In order to promote the introduction of new energy efficiently, it is necessary to compile the various information regarding new energy in a comprehensive and systematic way, and formulate a basic data set. Among various new energy technologies, cogeneration is discussed in this report. The latest published data on the respective technologies are compiled particularly regarding their overall systems, examples of introduction, assistance mechanisms and state of implementation in foreign countries. Items included in this report are the trend of cogeneration, outline of system, state of introduction, forecast of introduction, overview of policies, basic terms, and related organizations.

NTIS

Energy Technology; Thermoelectric Generators; Cogeneration; Thermal Energy; Waste Energy Utilization; Waste Heat

20010021097

Data book on new energy technology development in FY 1997. Fuel cells

Mar. 31, 1998; 186p; In Japanese; In English

Report No.(s): DE99-707586; NEDO-P-9713; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The purpose of this survey is to grasp the trends of technology development of fuel cells and their market, and to provide data required for supporting the introduction and diffusion of fuel cells. This report consists of Part 1 titled as 'Trends of development of fuel cells in FY 1997', and Part 2 titled as 'Compiled data'. The Part 1 consists of three chapters, i.e., Chapter 1 titled as 'Introduction', Chapter 2 as 'Development trends of fuel cells for on-site power generation', and Chapter 3 as 'Trends of development of fuel cells for mobile objects and fuel cell-powered vehicles'. The introductory chapter not only outlines the development trends but also describes the results of the 5th Grove Fuel Cell Symposium noticed as the major global international symposium on fuel cell in general and the environmental problems discussed at the COP3 Kyoto Conference, both held in TY 1997. The Part 2 contains the principles, system configurations and applications of fuel cells, PAFC, MCFC, SOFC, PEFC, modifier, DMFC, development trend of fuel cell-powered vehicles, and national policies for fuel cells in Japan. The Appendix features a report of the new technique investigation working group and information on fuel cells from newspapers.

NTIS

Energy Technology; Energy Policy; Fuel Cells; Electrolytic Cells; Diffusion Electrodes; Electrolytes

20010021148

Fiscal 1995 report on the results of the subsidy operation under the Sunshine Project on the development of a geothermal water use power plant, etc Development of the binary cydevelopment of the measurement while drilling system for geothermal wells

Mar. 31, 1996; 449p; In Japanese

Report No.(s): DE99-714253; ETDE/JP-99714253; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The R and D were conducted of a detection system for measurement of data on the bottom hole of geothermal well, data transmission and signal processing, and an analysis system for well drilling trajectory control and well assessment while drilling of geothermal wells based on the data obtained by the detection system, and the results were reported of the technical development in fiscal 1995. In the development of the downhole detection unit, the following developments were conducted: mud pulse generator, bottomhole signal processor, mode switches, inclination information sensor, power source, measures against vibration/shock, sonde external equipment, tests to confirm heat resistance of electronic parts, and design/manufacture of testing devices. In the development of the surface detection unit, the development was made of experimental analysis program, interface program, and simulation. In the development of the analysis system, as a well trajectory control support system, made were a trajectory planning/display system and a trajectory prediction system. As a downhole assessment support system, made were a temperature analysis system and a pressure analysis system.

NTIS

Geothermal Technology; Data Acquisition; Data Transmission; Signal Processing

20010021308 TNO Milieu, Energie en Procesinnovatie, Apeldoom, Netherlands

Technical Feasibility of Membrane Gas Absorption for Application in Fuel Cells on (Navel) Ships ***Final Report, 1 Aug. - 31 Dec. 2000 Toepassing van Membraan Gas Absorptie ten Behoeve van Brandstofcellen op Schepen***

Vercammen, E. L. J., TNO Milieu, Energie en Procesinnovatie, Netherlands; January 2001; 32p; In Dutch

Contract(s)/Grant(s): A00/KM/112; TNO Proj. 31550

Report No.(s): TD2000-0496; TNO-MEP-R2000/501; Copyright; Avail: Issuing Activity

Within the framework of the development of a new generation ship, The Royal Netherlands Navy identified the All-Electric-Ship (AES) as a serious candidate. It is expected that in this AES concept fuel cells can and will play a major role in the future. Because it is estimated that within the upcoming 3 to 4 decades diesel oil will be the only fuel to be used on board of naval ships, it is necessary to convert the diesel oil to a, for a fuel cell suitable, mixture of hydrogen and carbon dioxide, of which contaminations like carbon monoxide and hydrogen sulfide have to be reduced to low levels. The needed technology development is not taking place so far in the automobile industry. Therefore, it is decided to start an international program (EUCLID) for the development of a diesel reformer system to be used together with polymer fuel cells on navel ships. In relation to this international program it is investigated in this project whether it is possible to remove contaminants from the diesel reformer product stream (e.g. carbon monoxide and hydrogen sulfide) with the aid of membrane gas absorption, a hybrid separation technique, which is able to remove contaminants to low levels in a flexible, compact unit operation. From this investigation it appeared that the required low contamination levels could be reached using a compact unit based on membrane gas absorption technology. Additionally, it became clear that the used absorption liquid for the removal of carbon monoxide exhibited instability in the presence of oxygen. This instability deserves more attention in the further development path.

Author

Technology Assessment; Feasibility Analysis; Membranes; Fuel Cells; Carbon Monoxide; Hydrogen Sulfide

20010021484 TNO Environment, Energy and Process Innovation, Apeldoom, Netherlands

Euclid JP 16.04 Energy Storage: Battery Study ***Final Report, Jun. 1998 - Dec. 2000 EUCLID JP 16.04 Energy: Eindverslag Batterij Studie***

terVeen, W. R., TNO Environment, Energy and Process Innovation, Netherlands; Schmal, D., TNO Environment, Energy and Process Innovation, Netherlands; December 2000; 182p; In English

Contract(s)/Grant(s): A98/KM/115; TNO Proj. 30936

Report No.(s): TD-2000-0495; R2000/500; Copyright; Avail: Issuing Activity

The underlying Final Report concerns the part of the JP 16.04 Energy Storage study that inventories and evaluates Electrical Energy Storage in Batteries for military requirements. Batteries studied are lithium, (bipolar) lead acid, NaS NaNiCl2 and ZnBr These have been evaluated for Railgun Cargo and Ride Through missions. Cost and availability analysis have been carried out In conclusion lead acid, NiMH and lithium-ion batteries are the most promising for the short term, mid/long term and long term respectively. For all batteries ancillary systems, such as battery management, battery cooling, etc. are needed. Because the evaluated batteries in this study differ in many respects, it is not possible to rank them in order of preference. of the batteries considered only lead acid has current availability in the required size. In the medium to longer term, both nickel metal hydride and lithium ion have potential for significantly higher energy density than lead acid. Probably the NiMH battery will become commercially available in larger sizes before the lithium - ion battery. In the long term the lithium ion battery offers significant performance advantages.

Author

Electric Batteries; Electricity; Energy Storage; Flux Density; Inventories; Storage Batteries

20010021517 National Renewable Energy Lab., Golden, CO USA

Wind Resource Development Project for Armenia

Adamian, S.; Manoukian, L.; Lalayan, A.; Gervorgian, V.; Aug. 17, 2000; 9p; In English

Report No.(s): DE00-763426; NREL/CP-500-28598; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Armenia has few proven reserves of natural energy and is dependent on long, unreliable transport lines for oil and gas. Preliminary studies indicate that the wind energy potential in Armenia is more than 500 megawatts (MW), assuming a reasonable fraction of 10% of the land area in the high-wind zones. Over the long term, the Armenian government intends to meet 8%--10% of its electric consumption needs by grid-connected wind turbines. The goals of this project are to enhance Armenia's energy security, mitigate the environmental damage of conventional sources of energy, reduce future carbon dioxide emissions, build an environmentally sound and sustainable model for economic development, and promote trade between the U.S. and Armenia. The project is being funded by the Cafesjian Family Foundation, a private foundation based in the USA in Naples, Florida, with the participa-

tion of Ecotrade, Inc. of Glendale, California. The National Renewable Energy Laboratory (NREL) is providing technical assistance. As part of the wind energy development project, the authors conducted a preliminary wind-energy resource assessment for some regions in Armenia. This activity provided valuable information needed to facilitate the commercialization of wind farms in Armenia and to lay the groundwork for subsequent wind resource activities. This paper presents the wind resource monitoring results (1999--2000) for the candidate site. Preliminary assessment identified areas with good-to-excellent wind resource potential.
NTIS
Windpower Utilization; Wind Turbines; Economic Development; Energy Sources; Resources Management

20010021525 Sandia National Labs., Albuquerque, NM USA
Thermocline Thermal Storage Test for Large-Scale Solar Thermal Power Plants
St.Laurent, S. J.; Aug. 14, 2000; 19p; In English
Report No.(s): DE00-761869; SAND2000-2059C; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Solar thermal-to-electric power plants have been tested and investigated at Sandia National Laboratories (SNL) since the late 1970s, and thermal storage has always been an area of key study because it affords an economical method of delivering solar-electricity during non-daylight hours. This paper describes the design considerations of a new, single-tank, thermal storage system and details the benefits of employing this technology in large-scale (10MW to 100MW) solar thermal power plants. Since December 1999, solar engineers at Sandia National Laboratories' National Solar Thermal Test Facility (NSTTF) have designed and are constructing a thermal storage test called the thermocline system. This technology, which employs a single thermocline tank, has the potential to replace the traditional and more expensive two-tank storage systems. The thermocline tank approach uses a mixture of silica sand and quartzite rock to displace a significant portion of the volume in the tank. Then it is filled with the heat transfer fluid, a molten nitrate salt. A thermal gradient separates the hot and cold salt. Loading the tank with the combination of sand, rock, and molten salt instead of just molten salt dramatically reduces the system cost. The typical cost of the molten nitrate salt is $800 per ton versus the cost of the sand and rock portion at $70 per ton. Construction of the thermocline system will be completed in August 2000, and testing will run for two to three months. The testing results will be used to determine the economic viability of the single-tank (thermocline) storage technology for large-scale solar thermal power plants. Also discussed in this paper are the safety issues involving molten nitrate salts and other heat transfer fluids, such as synthetic heat transfer oils, and the impact of these issues on the system design.
NTIS
Thermoclines; Systems Engineering; Solar Thermal Electric Power Plants; Solar Energy Conversion; Heat Storage

20010021528 Argonne National Lab., IL USA
Costs of lithium-ion batteries for vehicles
Gaines, L.; Cuenca, R.; Aug. 21, 2000; 71p; In English
Report No.(s): DE00-761281; ANL/ESD-42; No Copyright; Avail: Department of Energy Information Bridge
One of the most promising battery types under development for use in both pure electric and hybrid electric vehicles is the lithium-ion battery. These batteries are well on their way to meeting the challenging technical goals that have been set for vehicle batteries. However, they are still far from achieving the current cost goals. The Center for Transportation Research at Argonne National Laboratory undertook a project for the US Department of Energy to estimate the costs of lithium-ion batteries and to project how these costs might change over time, with the aid of research and development. Cost reductions could be expected as the result of material substitution, economies of scale in production, design improvements, and/or development of new material supplies. The most significant contributions to costs are found to be associated with battery materials. For the pure electric vehicle, the battery cost exceeds the cost goal of the US Advanced Battery Consortium by about $3,500, which is certainly enough to significantly affect the marketability of the vehicle. For the hybrid, however, the total cost of the battery is much smaller, exceeding the cost goal of the Partnership for a New Generation of Vehicles by only about $800, perhaps not enough to deter a potential buyer from purchasing the power-assist hybrid.
NTIS
Electric Motor Vehicles; Electric Hybrid Vehicles; Lithium; Metal Ions; Cost Reduction; Lithium Batteries

20010021614 Energy Information Administration, Office of Integrated Analysis and Forecasting, Washington, DC USA
Voluntary Reporting of Greenhouse Gases, 1999
Jan. 2001; 192p; In English; Original contains color illustrations
Report No.(s): PB2001-102494; DOE/EIA-0608(99); No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

The Voluntary Reporting of Greenhouse Gases Program, required by Section 1605(b) of the Energy Policy Act of 1992, records the results of voluntary measures to reduce, avoid, or sequester greenhouse gas emissions. A total of 201 U.S. companies and other organizations reported to the Energy Information Administration (EIA) that, during 1999, they had undertaken 1,715 projects, which achieved greenhouse gas emission reductions and carbon sequestration equivalent to 226 million metric tons carbon dioxide, or about 3.4 percent of total 1999 U.S. greenhouse gas emissions. The emission reductions reported usually were measured by comparing an estimate of actual emissions with an estimate of what emissions would have been had the project not been implemented.

NTIS
Greenhouse Effect; Energy Policy; Exhaust Emission; Exhaust Gases; Pollution Control; Climate Change; Air Pollution

45
ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20010019838 ARCADIS Geraghty and Miller, Inc., Research Triangle Park, NC USA
SO2 Scrubbing Technologies: A Review
Srivastava, R. K.; Singer, C.; Jozewicz, W.; Jun. 18, 2000; 22p; In English; Air and Waste Management Association (EPA) 2000 Annual Conference, Salt Lake City, UT., June 18-22, 2000
Report No.(s): PB2001-101635; No Copyright; Avail: National Technical Information Service (NTIS)

The paper gives results of a review of commercially available flue gas desulfurization (FGD) technologies that have an established record of performance. Data on worldwide FGD applications reflect that wet FGD technologies have been used at most of the installations. Among the worldwide FGD technology installations completed through 1998, most (522 out of 668) consist of wet FGD systems. The sulfur dioxide (SO2) removal performance of scrubbers has been reviewed. Data reflect that most wet limestone and lime spray drying installations appear to be capable of about 90% SO2 removal. Advanced state-of-the-art wet scrubbers can provide SO2 removal in excess of 95%. A review of recently reported advancements in SO2 scrubbing technologies is presented. Some of these advancements have been aimed at improving the performance and cost-effectiveness of established processes.

NTIS
Desulfurizing; Sulfur Dioxides; Scrubbers; Acid Rain; Pollution Control; Flue Gases

20010019840 Environmental Protection Agency, National Risk Management Research Lab., Research Triangle Park, NC USA
Characterization and Control of Fine Particles: Overview of NRMRL Research Activities
Miller, C. A.; 2000; 14p; In English; Conference, Tropospheric Aerosols: Science and Decisions in an International Community, Queretaro, Mexico, October 23-26, 2000
Report No.(s): PB2001-101546; EPA/600/A-00/112; No Copyright; Avail: National Technical Information Service (NTIS)

Research at the U.S. Environmental Protection Agency's (EPA's) National Risk Management Research Laboratory (NRMRL) in the area of particulate matter (PM) is designed to provide critical information regarding emission rates, characteristics, and control approaches in aerodynamic diameter. This research will provide information needed by source receptor models to identify the contribution of different sources to the ambient particle loading. Emissions characterization research is being conducted on particle size and composition for residual wood combustion systems such as woodstoves and fireplaces, for industrial combustion sources burning coal and heavy fuel oil, for diesel truck engine during on-road operation, and for open burning of biomass. Researchers are studying innovative control technologies for stationary sources, and they are also collaborating with different scientists and organizations to link particle characteristics to health effects and particles in the atmosphere to create a base of broad scientific expertise and interaction.

NTIS
Air Quality; Particulates; Air Pollution; Biomass Burning; Combustion; Research; Environment Protection

20010019866 Army Construction Engineering Research Lab., Champaign, IL USA

An Evaluation of DGPS-Based Continuously Operating Vehicle Monitoring Systems to Determine Site-Specific Event Severity Factors ***Final Report***

Ayers, Paul, Army Construction Engineering Research Lab., USA; Vance, Michael, Army Construction Engineering Research Lab., USA; Haugen, Liv, Army Construction Engineering Research Lab., USA; Anderson, Alan B., Army Construction Engineering Research Lab., USA; December 2000; 48p; In English

Report No.(s): AD-A385704; ERDC/CERL-TR-00-43; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Army Training and Testing Area Carrying Capacity (ATTACC) methodology was developed to estimate the carrying capacity of training and testing land. ATTACC is part of the Army's Integrated Training Area Management (ITAM) Program. The ATTACC methodology quantifies the training load in terms of Maneuver Impact Miles, which are based on training impact factors. Training impact factors represent the difference in impact between various vehicles and events. ATTACC uses Event Severity Factors to account for different types of training exercises. This report evaluates the potential to use data from differentially corrected global positioning systems (DGPS) in real time and post-processing to monitor site-specific vehicle impacts and more accurately estimate ATTACC Event Severity Factors. The results show that the two global positioning systems tested can accurately monitor a vehicle's position and dynamic properties including velocity, turning radius, and change in velocity. This data can then be used to determine the Event Severity Factors.

DTIC

Armed Forces; Real Time Operation; Global Positioning System; Military Vehicles; Environment Effects; Training Devices

20010019906 Norwegian Defence Research Establishment, Kjeller, Norway

Analysis of Polychlorinated Biphenyls (PCBs) in Seawater ***Analyse av Polyklorerte Bifenyler (PCB) i Sjovann***

Johnsen, Arnt, Norwegian Defence Research Establishment, Norway; Rossland, Helle Kristin, Norwegian Defence Research Establishment, Norway; Boyum, Olav, Norwegian Defence Research Establishment, Norway; Christiansen, Magnus, Norwegian Defence Research Establishment, Norway; Dec. 20, 2000; 46p; In Norwegian; Original contains color illustrations

Contract(s)/Grant(s): FFIBM Proj. 720/138.2

Report No.(s): FFI/RAPPORT-2000/05945; ISBN 82-464-0479-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A system for extraction of traces of polychlorinated biphenyls (PCB) in large quantities of sea water has been evaluated. The system consist of XAD-2 as an adsorbent for the soluble fraction of PCB and a filter to collect the particle fraction of PCB in sea water. Laboratory experiments shows that the adsorption of soluble PCB in XAD-2 is over 60% at a flow of 7 1/min. It is necessary with extensive clean up of the extract, which lead to difficulties if other compounds than PCB should be quantified. It was impossible to find particle filters good enough to retain particles down to 0.45 gm and at the same time show no adsorption of soluble PCB. The best particle filter with respect to adsorption of soluble PCB was a 1.0 gm cartridge filter from Millipore. A laboratory experiment with a glass fiber filter burn at 500 C showed an adsorption of about 30% soluble PCB, while a field experiment showed insignificant absorption of soluble PCB. Field measurement shows that the concentration of PCB in sea water at the naval base Haakonsvern is higher than the levels at Aker Brygge, Oslo, in the harbour of Horten and at Vestre Bolaerne. High chlorinated congeners dominate the soluble fraction while low chlorinated congeners dominate the particle fraction.

Author

Adsorption; Polychlorinated Biphenyls; Sea Water; Extraction

20010019925 Army Engineer Research and Development Center, Environmental Lab., Vicksburg, MS USA

Field Survey of Contaminant Concentrations in Existing Wetlands in the San Francisco Bay Area ***Final Report***

Lee, C. R., Army Engineer Research and Development Center, USA; Brandon, D. L., Army Engineer Research and Development Center, USA; Simmers, J. W., Army Engineer Research and Development Center, USA; Tatem, H. E., Army Engineer Research and Development Center, USA; Price, R. A., Army Engineer Research and Development Center, USA; Miner, S. P., Army Engineer Research and Development Center, USA; November 2000; 118p; In English

Report No.(s): AD-A385446; ERDC/EL-SR-00-15; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

The importance of wetlands to the productivity of estuaries has been realized in the San Francisco Bay Area. A heightened public interest has emerged to restore wetland acreage that has dwindled away over the past 50 years. Dredged material was thought to be of potential value in wetland creation or restoration. This report presents the results of a field survey of existing wetland sites in the San Francisco Bay Area. Dominant plants, of existing wetland sites in the San Francisco Bay Area. Dominant plants, animals (where present) and wetland soil from selected marine and estuarine wetlands were sampled and analyzed for con-

taminants. These data will be used to establish a wetland reference database. Sediment biological and chemical test results concentrations will be compared to the reference database to evaluate its potential use in wetland creation.
DTIC
San Francisco Bay (CA); Wetlands; Contaminants; Water Pollution; Surveys

20010019978 Environmental Protection Agency, Office of Air and Radiation, Washington, DC USA
Environmental Fact Sheet: Partnership of a New Generation of Vehicles and the Environment
Apr. 1998; 10p; In English; Original contains color illustrations
Report No.(s): PB2001-102134; EPA/420/F-98/007; No Copyright; Avail: National Technical Information Service (NTIS)

The Partnership for a New Generation of Vehicles (PNGV) is a 10-year joint research and development effort between government and industry. The Partnership was established in 1993 to develop new automotive technology. The goal is to design new technology that will help reduce air pollution by tripling the fuel economy of typical family sedans without sacrificing other important consumer attributes such as safety, performance, and affordable cost.
NTIS
Air Pollution; Automobiles; Fuels; Environmental Quality

20010019981 Sandia National Labs., Albuquerque, NM USA
Site Characterization and Analysis Penetrometer System (SCAPS) Laser-Induced Fluorescence (LIF) Sensor and Support System. Innovative Technology Verification Report
Bujewski, G.; Rutherford, B.; Feb. 1997; 116p; In English
Report No.(s): PB2001-101834; No Copyright; Avail: National Technical Information Service (NTIS)

In May and October, 1995, two cone penetrometer-deployed sensor systems were demonstrated to evaluate how well they could measure subsurface petroleum hydrocarbon contamination. The performance of each system was evaluated by comparing field analysis results to those obtained using conventional sampling and analytical methods. These methods included using a hollow stem auger in conjunction with a split spoon sampler and subsequent analysis of the collected sample by a reference laboratory using EPA Method 418.1 for total recoverable petroleum hydrocarbons (TRPH) and California Department of Health Services Method 8015-Modified for total petroleum hydrocarbons. The primary objectives of the demonstration were to (1) verify technology performance, (2) determine how well the developer's field instrument performs in comparison to conventional laboratory methods, (3) determine the logistical and economic resources needed to operate the instrument, and (4) produce a verified data set for use in considering the technology for future use in hazardous waste investigations.
NTIS
Crude Oil; Hydrocarbons; Laser Induced Fluorescence; Penetrometers; Characterization; Technology Utilization

20010019982 ARCADIS Geraghty and Miller, Inc., Research Triangle Park, NC USA
Controlling SO2 Emissions: An Analysis of Technologies *Final Report, May 1999 - May 2000*
Srivastava, R. K.; Nov. 2000; 118p; In English
Report No.(s): PB2001-101224; No Copyright; Avail: National Technical Information Service (NTIS)

The report describes flue gas desulfurization (FGD) technologies, assesses their applications, and characterizes their performance. Additionally, it describes some of the advancements that have occurred in FGD technologies. Finally, it presents an analysis of the costs associated with applications of limestone forced oxidation, lime spray dryer, and magnesium-enhanced lime FGD processes. The information presented should be useful to evaluators of FGD technology applications. (NOTE: Sulfur dioxide (SO2) scrubbers may be used by electricity generating units to meet the requirements of Phase II of the Acid Rain SO2 Reduction Program. Additionally, the use of scrubbers can result in reduction of mercury and particulate emissions. It is timely, therefore, to review the commericallly available FGD technologies that have an established record of performance.)
NTIS
Sulfur Dioxides; Air Pollution; Emission; Pollution Control; Flue Gases; Desulfurizing; Technology Assessment

20010020043 Envair, Albany, CA USA
Data Analysis Complementing Proximate Modeling of the Weekday/Weekend Ozone Differences in Southern California *Final Report*
Blanchard, C. L.; Tanenbaum, S.; Oct. 08, 2000; 56p; In English
Report No.(s): PB2001-101426; CRC-A-36A-2; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this study, ambient environmental data were analyzed to describe and evaluate weekday and weekend ozone formation in Southern California, focusing on California's South Coast Air Basin (SoCAB) but also including the San Diego, South Central

Coast, Salton Sea, and Mojave air basins. Data from the time period 1991 through 1998 were used to characterize where weekend ozone concentrations exceeded or lower than weekday levels. Key geographical patterns were identified and depicted using visually-effective map displays. Results were characterized both for the full period from 1991 through 1998 and for the periods from 1991 through 1994 and 1996 through 1998. These time periods were of interest because California Phase 2 reformulated gasoline was introduced at the beginning of 1995 while federal Phase I reformulated gasoline was introduced at the beginning of 1996.
NTIS
Ozone; Air Pollution; Southern California; Contaminants

20010020046 Battelle Columbus Labs., OH USA
Draft Site-Specific Technical Report (A003) for Bioslurper Testing at Site 24, Edwards AFB, California
Leeson, A.; Kramer, J.; Kittel, J. A.; Eastep, J.; Woolfe, M.; Aug. 02, 1996; 151p; In English
Contract(s)/Grant(s): F41624-94-C-8012
Report No.(s): AD-A384645; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report summarizes the field activities conducted at Edwards AFB, for a short-term field pilot test to compare vacuum-enhanced free-product recovery (bioslurping) to traditional free-product recovery techniques to remove light, nonaqueous-phase liquid (LNAPL) from subsurface soils and aquifers. The field testing at Edwards AFB is part of the Bioslurper Initiative, which is funded and managed by the U.S. Air Force Center for Environmental Excellence (AFCEE) Technology Transfer Division. The AFCEE Bioslurper Initiative is a multisite program designed to evaluate the efficacy of the bioslurping technology for (1) recovery of LNAPL from groundwater and the capillary fringe, and (2) enhancing natural in situ degradation of petroleum contaminants in the vadose zone via bioventing. The main objective of the Bioslurper Initiative is to develop procedures for evaluating the potential for recovering free-phase LNAPL present at petroleum-contaminated sites. The overall study is designed to evaluate bioslurping and identify site parameters that are reliable predictors of bioslurping performance. to measure LNAPL recovery in a wide variety of in situ conditions, tests are being performed at many sites. The test at Edwards AFB is one of at least 35 similar field tests to be conducted at various locations throughout the USA and its possessions. The intent of field testing is to collect data to support determination of the predictability of LNAPL recovery and to evaluate the applicability, cost, and performance of the bioslurping technology for removal of free product and remediation of the contaminated area. The on-site testing is structured to allow direct comparison of the LNAPL recovery achieved by bioslurping with the performance of more conventional LNAPL recovery technologies. The test method included an initial site characterization followed by LNAPL recovery testing.
DTIC
Ground Water; Field Tests; Contaminants; Water Pollution; Contamination; Degradation; Crude Oil

20010020054 Environmental Protection Agency, National Exposure Research Lab., Research Triangle Park, NC USA
Results of Photochemical Simulations of Subgrid Scale Point Source Emissions with the Models-3 CMAQ Modeling System
Godowitch, J. M.; 2000; 10p; In English
Report No.(s): PB2001-101918; EPA/600/A-00/114; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Community Multiscale Air Quality (CMAQ)/Plume-in-Grid (PinG) model was applied on a domain encompassing the greater Nashville, Tennessee region. Model simulations were performed for selected days in July 1995 during the Southern Oxidant Study (SOS) field study program which was conducted in the Nashville area. In particular, five major point sources exhibiting a range of NOx emission rates were selected for the PinG treatment. Selected PinG model concentrations and representative examples of the initial results of an ongoing evaluation of the PinG model with the SOS/Nashville data are presented to provide a preliminary demonstration of the capability of the CMAQ/PinG approach. In particular, modeled concentrations of ozone, SO2, and nitrogen oxides are compared to plume data collected during horizontal traverses by an instrumented helicopter and research aircraft across different plumes. Statistical results are also provided at 40 km downwind of the largest point source. The comparisons and quantitative results are encouraging as PinG exhibited the capability to realistically simulate the observed photochemical evolution for ozone and other species at various downwind distances for these cases.
NTIS
Air Quality; Photochemical Reactions; Point Sources; Emission; Computerized Simulation

20010020065 Universities Space Research Association, Data Assimilation Office, Greenbelt, MD USA
Climatology of the Finite-Volume CCM and Sensitivity Studies
Pawson, Steven, NASA Goddard Space Flight Center, USA; Lin, Shian-Jiann, NASA Goddard Space Flight Center, USA; Nebuda, Sharon, NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A new model has been developed in the Data Assimilation Office at NASA Goddard Space Flight Center. It is intended for data assimilation and general circulation modeling, including representations of radiatively active trace gases such as stratospheric ozone. The model is based on the flux-form semi-Lagrangian' dynamical core, developed by Lin and Rood. In collaboration with the National Center for Atmospheric Research, the physical parametrization package from the Community Climate model, Version 3, has been included. This paper will discuss the climatology of a multi-year integration of the model, with observed boundary conditions (sea-surface temperature, sea ice, and incoming solar radiation). The standard model version has a resolution of 2.5 degrees longitude, 2 degrees latitude and has 55 levels between the surface and 80km. The mean climate and interannual variability of this model will be discussed, with emphasis on the middle atmosphere. The sensitivity to horizontal resolution will be examined, as will the impact of increasing and decreasing the vertical resolution. Changes which differ significantly from the interannual variations of the control run will be highlighted. Impacts of using long-term mean boundary conditions or values which vary from year to year will be discussed. Changes in the tropospheric circulation induced by lowering the upper boundary of the model will be discussed. The emphasis of the paper is on the climatology of the middle atmosphere and its impacts on the troposphere, with particular attention given to the climatologically important region near the tropopause.
Author
Climate Models; Climatology; Finite Volume Method; Atmospheric Circulation

20010020233 Geological Survey, Water Resources Div., Lemoyne, PA USA
Quality-Assurance Design Applied to an Assessment of Agricultural Pesticides in Ground Water from Carbonate Bedrock Aquifers in the Great Valley of Eastern Pennsylvania
Breen, K. J., Geological Survey, USA; 2000; 44p; In English; Prepared in cooperation with the Department of Agriculture, Harrisburg, PA
Report No.(s): PB2001-101961; USGS/WRI-00-4104; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Assessments to determine whether agricultural pesticides are present in ground water are performed by the Commonwealth of Pennsylvania under the aquifer monitoring provisions of the State pesticides and Ground Water Strategy. Pennsylvania's Department of Agriculture conducts the monitoring and collects samples; the Department of Environmental Protection (PaDEP) Laboratory analyzes the samples to measure pesticide concentration. to evaluate the quality of the measurements of pesticide concentration for a groundwater assessment, a quality-assurance design was developed and applied to a selected assessment area in Pennsylvania. This report describes the quality-assurance design, describes how and where the design was applied, describes procedures used to collect and analyze samples and to evaluate the results, and summarizes the quality-assurance results along with the assessment results.
NTIS
Ground Water; Pesticides; Water Sampling; Quality Control

20010020356 CH2M/Hill, Inc., Sacramento, CA USA
Photolytic Destruction Technology Technical Memorandum. Environmental Management of Offgas Technology. Site S, Operable Unit D *Final Report*
Jul. 1996; 32p; In English
Contract(s)/Grant(s): F04699-93-D-0017
Report No.(s): AD-A385769; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
The Photolytic Destruction Technology (PDT) was one of two innovative technologies chosen for demonstration as part of McClellan Air Force Base's ongoing innovative technology demonstration program at operable unit (OU) D Soil Vapor Extraction (SVE) System. The objectives of the demonstration programs are to develop full-scale operating, performance, and cost data on technologies that have the potential to cost-effectively remediate contaminated sites. Working together, through this program, with the federal Environmental Protection Agency (EPA) and the California EPA, the Air Force is proceeding with effective environmental cleanup. The objectives of the PDT demonstration include the following: 1) Evaluate and determine whether PDT is ready for use as an offgas treatment technology; 2) Determine the destruction removal efficiency (DRE) of any detectable volatile organic compounds (VOC's), semivolatile organic compounds (SVOCs), and acetone; 3) Measure the hydrochloric acid, hydrofluoric acid, phosgene, dioxin, nitrogen oxides, ozone, and carbon monoxide produced during oxidation; 4) Determine any condensate streams (or other byproducts) resulting from pretreatment if required, and evaluate recombination products (generated in the reactor) that need disposal; 5) Determine the utility requirements of the innovative technology system; 6) Evaluate the cost to implement, operate, and maintain the equipment for full-scale operations; 7) Conduct a toxic characteristics leaching procedure (TCLP) analysis of the reagent (panel material) to determine whether it requires any special handling or disposal; for example, if it is characterized as a hazardous material; 8) Evaluate the effectiveness of Process Technology Incorporated's (PTI) design

modifications with respect to deposition of the tarry substance seen during a previous demonstration, and its potential impact on reactor reliability and performance.
DTIC
Photolysis; Extraction; Soils; Technology Assessment; Vapors; Volatile Organic Compounds; Environment Protection

20010020403 New Jersey Marine Sciences Consortium, Fort Hancock, NJ USA
Proceedings: The Significance of Atmospheric Pollutant Loading to the New York-New Jersey Harbor Estuary and Watershed
Weinstein, Michael P., Editor; Kosko, Kim E., Editor; Young, Lisa S., Editor; Belton, Thomas J., Editor; Apr. 13, 2000; 62p; In English; Original contains color illustrations
Report No.(s): PB2001-102180; NJSG-00-443; Copyright; Avail: National Technical Information Service (NTIS)
This workshop was developed by the NJDEP's Division of Science and Technology, and organized by the New Jersey Marine Sciences Consortium to review existing air-water data with emphasis on current research in and around the New York-New Jersey Harbor Estuary. A specific strategy of the work-shop was to recommend ways to incorporate the data into science-based management strategies. Key objectives were to: (1) explore the feasibility for incorporating air components into the watershed management process; and (3) identify the order of these steps and the appropriate endpoints for the process.
NTIS
Conferences; Air Pollution; Environment Protection; Contaminants; Watersheds; Estuaries

20010020407 Environmental Protection Agency, Emission Inventory Improvement Program, Research Triangle Park, NC USA
Emission Inventory Improvement Program (EIIP), Phase 2, Future Directions for the Millennium 2000
2000; 34p; In English
Report No.(s): PB2001-102353; No Copyright; Avail: National Technical Information Service (NTIS)
The Emission Inventory Improvement Program (EIIP) was established in 1993 to promote developing and using standard procedures for collecting, calculating, storing, reporting, and sharing air emission inventory (EI) guidance documents, establishing data management and quality assurance/quality control (QA/QC) programs, providing training, and serving as a forum to enhance communication among the inventory community.
NTIS
Inventories; Data Transmission; Data Management; Air Pollution; Emission

20010020433 Army Research Office, Research Triangle Park, NC USA
Guidelines for Phase Separations in High-Temperature and Supercritical Water Solutions
Shaw, Robert W., Army Research Office, USA; Boukis, Nikolaos, Army Research Office, USA; November 2000; 69p; In English, 7-9 Jul. 1999, Unknown; Sponsored by Army Research Office, USA
Report No.(s): AD-A384659; ARL-SR-99; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
The US Army is developing supercritical water oxidation for destruction of military toxic materials. The properties of high-temperature aqueous solutions are not, in most cases, well known. Understanding the phase behavior of these solutions will facilitate design and efficient operations of high-temperature water reactors. A US Army workshop held at the Forschungzentrum Karlsruhe in July 1999 assembled experts on phase behavior to develop guidelines that, in the absence of more complete knowledge of solution properties, will aid reactor designers and operators. The experts presented papers on model systems, properties of high-temperature aqueous solutions, and chemistry in high-temperature water. Following these presentations, the experts developed some of the desired rules of thumb and made recommendations for research to develop these guidelines further. This workshop report includes the presentation papers, guidelines, and recommendations for research.
Author
Aqueous Solutions; Toxicity; Water; Military Technology; Conferences

20010020450 North Carolina Agricultural and Technical State Univ., Div. of Research, Greensboro, NC USA
The Effect of Heating During In Situ Remediation on the Dynamics and Activity of Soil Microorganisms *Final Report, 15 May 1998 - 14 May 1999*
Schimmel, Keith A., North Carolina Agricultural and Technical State Univ., USA; October 2000; 129p; In English
Contract(s)/Grant(s): F41624-98-1-0003
Report No.(s): AD-A383802AFRL-ML-TY-TR-2000-4568; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy
The primary objective of this study was to advance knowledge regarding the microbial ecology associated with in situ resistive heating remediation technologies. After being unable to identify a cooperating remidation site using resistive heating, the

study focussed on understanding the microbial ecology at the lab-scale. Experiments were performed in three insulated boxes (0.5 m x 0.5 m x 0.1 m) containing medium sand soil heated to just below 100 C. After heating for 20 hours, cooling to room temperature, and remaining at room temperature for one week, three different amendments were tested: (1) organic media, (2) inorganic media, and (3) sterile water. Acridine Orange Direct Counts (AODC) and Phospholipid Fatty Acid Analysis (PLFA) one week after the nutrient addition indicated that the microbial numbers for the organic treatment were highest, but only half the initial count. The primary features of the community structure changes from the initial soil were small increases in gram positive bacterial and small decreases in eukaryotes. Heating and cooling two-dimensional temperature profiles measured during the experiments were compared to profiles generated from mathematical models. This study provides helpful groundwork for future resistive heating microbial ecology studies at the field scale.
Author
Bacteria; Temperature Effects; Temperature Profiles; Microbiology

20010020459 Texas A&M Univ., Center for Coastal Studies, Corpus Christi, TX USA
Development of Marine Sediment Toxicity Data for Ordnance Compounds and Toxicity Identification Evaluation Studies at Select Naval Facilities ***Final Report***
Carr, Scott, Geological Survey, USA; Nipper, Marion, Texas A&M Univ., USA; August 2000; 194p; In English
Report No.(s): AD-A383951; NFESC-CR-01-002-ENV; No Copyright; Avail: CASI; A03, Microfiche; A09, Hardcopy

To assess the potential impact of contamination by ordnance compounds and their contribution to environment degradation in two areas of Puget Sound, Washington, an extensive study was undertaken. It included the generation of a toxicity database of ordnance compounds to marine organisms, and sediment toxicity and chemical analyses of 50 stations in the vicinity of the Jackson Park and Port Hadlock naval facilities, Puget Sound, including Toxicity Identification Evaluation (TIE) studies at selected stations. Eight ordnance compounds of concern were selected and analyzed for toxicity with six different kinds of marine toxicity tests, which included five species and phyla, and nine endpoints. Toxicity tests and endpoints were fertilization success and embryological development with the sea urchin Arbacia punctulata; zoospore germination, germling length and cell number with the green macro-alga Ulva fasciata; survival and reproductive success of polychaete Dinophilus gryociliatus; larvae survival with the redfish Sciaenops ocellatus; and survival of juveniles of the opossum shrimp Mysidopsis bahia. The overall toxicity, chemistry, and TIE test results indicate that ordnance compounds are not contaminants of concern at any of the sites studied in Puget Sound, Washington.
Author
Marine Biology; Ordnance; Toxicity; Contamination

20010020573
Dispersion modelling system for urban air pollution
Karppinen, A.; Kukkonen, J.; Nordlund, G.; Rantakrans, E.; Valkama, I.; Dec. 31, 1998; 63p; In English
Report No.(s): DE99-701982; ITL/IS-JULK-28; ISBN 951-697-480-5; No Copyright; Avail: Department of Energy Information Bridge

An Urban Dispersion Modelling system UDM-FMI, developed at the Finnish Meteorological Institute is described in the report. The modelling system includes a multiple source Gaussian plume model and a meteorological pre-processing model. The dispersion model is an integrated urban scale model, taking into account of all source categories (point, line, area and volume sources). It includes a treatment of chemical transformation (for NO(sub 2)) wet and dry deposition (for SO(sub 2)) plume rise, downwash phenomena and dispersion of inert particles. The model allows also for the influence of a finite mixing height. The model structure is mainly based on the state-of-the- art methodology. The system also computes statistical parameters from the time series, which can be compared to air quality guidelines. The relevant meteorological parameters for the dispersion model are evaluated using data produced by a meteorological pre-processor. The model is based mainly on the energy budget method. Results of national investigations have been used for evaluating climate-dependent parameters. The model utilizes the synoptic meteorological observations, radiation records and aerological sounding observations. The model results include the hourly time series of the relevant atmospheric turbulence.
NTIS
Air Pollution; Models; Time Series Analysis; Dispersions; Air Quality

20010020751 Lembaga Penerbangan dan Antariksa Nasional, Atmosphere Research and Development Center, Jakarta, Indonesia

Relations Between Surface Ozone and Its Precursors (A case Study: Jakarta) ***Hubungan Ozon Permukaan Dan Prekursornya (Studi Kasus: Jakarta)***

Budiyono, Afif, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Nurlaini, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Adikusumah, Nurzaman, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Majalah LAPAN; July 2000; ISSN 0126-0480; Volume 2, No. 3, pp. 123-129; In Malay-Indonesian; Copyright; Avail: Issuing Activity

From the analyzing Jakarta data of NOx (nitrogenoxides), NMHC (nonmethan hydrocarbon), THC (Total Hydrocarbon), and temperature which had been measured during April 1996 period, we found that concentrations of THC and NMHC are linearly correlated, with 90% correlation factor. It also can be presented that the background of NHMC air pollution for Jakarta is relatively higher than West Coast Air Basin of Athens (WCA) and South Coast Air Basin of California (SCQ). We also found that the difference between the polynomial model of ozone and its precursor correlation and the observation data is large enough. The estimation from plotting of NMHC/NOx ratio of about 15.77 to 1 at the point concentration 1.03 ppmC NMHC and 0.07 ppm NOx, we found that the ozone concentration is about 0.25 ppmv, which is higher than the calculated daily average of about 0.08 ppmv.

Author

Air Pollution; Hydrocarbons; Nitrogen Oxides; Ozone

20010020792

Radiological situation at the atolls of Mururoa and Fangataufa. Proceedings of a conference

Aug. 31, 1998; 75p; In English; International conference on the radiological situation at the atolls of Mururoa and Fangataufa

Report No.(s): DE99-605434; INIS-XA-083; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In January 1996, France's programme of experiences nucleaires (nuclear experiments) at the atolls of Mururoa and Fangataufa ceased, and soon after that the French Government requested the International Atomic Energy Agency (IAEA) to carry out a study of the radiological situation at the two atolls. The study of the Radiological Situation at the Atolls of Mururoa and Fangataufa lasted almost two years, giving rise to a number of reports which are being issued by the IAEA. From 30 June to 3 July 1998, the IAEA hosted, in Vienna, an International Conference on the Study, the main purpose being to facilitate discussion of the results of the study by the scientific community and other interested parties. The Conference was presided over by Eduardo Bobadilla Lopez of Chile. These proceedings contain the opening addresses of the Conference, a presentation made by a senior representative of France's Commissariat a l'energie atomique and closing remarks by the President of the Conference, by E. Gail de Planque, Chairman of the International Advisory Committee and by Mohamed ElBaradei, Director General of the IAEA. the also contain edited texts reflecting the discussions which took place during the Conference, mainly after the technical presentations covering the various aspects of the Study. These presentations generally paralleled the Main Report on the Study, to which reference is made in the edited texts.

NTIS

Conferences; Radiology; Environment Effects; Radiation Measurement; Radiation Dosage; Radioactivity; Radiation Hazards

20010020812

Research report of fiscal 1997: Environmental regulation for combustion of fuel oil in Japan

Mar. 31, 1998; 51p; In Japanese

Report No.(s): DE99-714238; NEDO-GET-9736; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In order to contribute to economic development of Asian countries, global environment preservation, and stable supply and demand of energy according to the situation of every Asian country, research was made on environmental regulations for fuel oil in Japan. In Asian countries, demand for fuel oil is increasing with a rapid economic growth, however, environmental regulations are poor. In Japan, the regulations are conducted based on laws and tax systems, while local governments are conducting precise regulations according to sizes of combustors and scales of factories based on their own rules. These contribute to not only environment preservation but also a stable supply and demand balance between fuel oils. Introduction of the regulations accumulated in Japan to Asian countries can contribute to decision of regulation policies in Asian countries. The trend of an environmental policy in Japan is described, and research was made mainly on the most important Air Pollution Control Law. The role of Japanese local governments is arranged, and research was made on their concrete approach examples. The regulations and their effects are also summarized.

NTIS

Fuel Oils; Combustion; Environment Management; Air Pollution; Pollution Control; Regulations

20010020839

Fiscal 1997 report on the investigational research on the evaluation of a global energy system as global environmental protection technology, 2

Mar. 31, 1998; 276p; In Japanese

Report No.(s): DE99-714225; NEDO-GET-9705; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An energy supply system which is globally formed for global environmental protection is called a global energy system (GES), in which to achieve substantial CO2 reduction, various measures against CO2 are introduced to energy systems extending from places of fuel supply to places of fuel consumption. For the study of a scenario for introduction such a GES, it is necessary to investigate the GES presently proposed and make a traverse evaluation of it under uniform preconditions and evaluation criteria. Concretely, following a case study of evaluating performance of the GES with a power system as the final form from viewpoints of economy, energy balance, CO2 emissions, etc., the paper arranged characteristics of liquid fuel supply systems including methanol from a traverse aspect, made evaluation of performance and possibilities of the introduction in the areas concretely named, and studied positioning of this energy system, scenario for the future introduction and possibilities of the introduction from global and long-term aspects.

NTIS

Carbon Dioxide; Air Pollution; Environment Protection; Liquid Fuels; Energy Budgets; Fuel Systems

20010020840

Survey report of FY 1997 on the application of plasma to advanced environmentally acceptable technologies, 2

Mar. 31, 1998; 147p; In Japanese

Report No.(s): DE99-714224; NEDO-GET-9704; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report describes the latest technological trend of plasma which will be useful for a better global environment. Novel application field of plasma technology has been studied in detail. A definite research plan for a better global environment has been proposed. At first, current global environmental issues are reviewed, and the background and the purpose of present investigation are described. Then, are described the plasma generation, measurement and control technology, and the application of plasma technology for a chemical reaction, especially, the promising chemical reaction with highly sensitive and/or highly selective process. In addition, is reviewed the development of a multi-functional membrane using energy control technology of plasma particles, and an advanced catalyst made by plasma-based technology. Is also described the application of plasma to the fixation of CO2 and reuse of greenhouse gases such as CO2 and CH4. Are described the results of the study on capture and reuse of environmental pollutants. The contribution of plasma technology to the production process with low environmental load is provided. Finally, a research plan for plasma technology aiming at a better global environment is proposed on the basis of present investigation.

NTIS

Energy Technology; Plasma Generators; Contaminants; Chemical Reactions; Environmental Engineering

20010020841

Validation of diffusive samplers for the measurement of hydrocarbons in ambient air

Dec. 31, 1998; 97p; In German; In English

Report No.(s): DE99-713064; ETDE-DE-728; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The suitability of diffusive (passive) samplers of the type ORSA (Draeger company) and the tubes of the Perkin Elmer company (filled with Chromosorb 106) for the determination of benzene, toluene, ethylbenzene, and xylenes (BTEX) in ambient air was investigated in laboratory and field studies at several measurement sites of different air quality. Standardized procedures with active sampling were used as an independent method. The precision of sampling and analysis for the passive measurement methods is described in terms of standard deviations of four parallel measurements. Values of 4 to 5 percent were found for benzene and toluene using the ORSA type samplers. In all cases a dependence of the uptake rates on the substance dose (product of concentration and exposure time) was observed. The mass of the analyte sampled in dependency of the dose is well described with potential functions. In addition, the Perkin Elmer tubes with Chromosorb 106 showed an influence of the uptake rates by ambient temperature due to back diffusion which was taken into account calculating concentration values. Differences of up to 2-3 percent were found comparing the concentration values of active and passive sampling for the measurement stations used for the calibration procedure. This evaluation is based on about 55 values of exposure periods of two weeks and four weeks and uninterrupted measurements with the independent, active method. Coefficients of variation for the ORSA measurement method were found to be 13 to 15 percent for benzene and toluene and about 20 percent for ethylbenzene and the xylenes, respectively. For the Perkin Elmer type samplers values of about 20 percent were calculated (exposure time of four weeks). These coefficients of variation can be taken as an upper limit of the measurement uncertainty, because they contain parts of the uncertainty of the active method.

The calibration of the ORSA diffusive samplers was checked during a monitoring campaign in the vicinity of a coke plant. The comparison of measurement results from the ORSA method and the independent method with active sampling show remarkable agreement for benzene whilst the concentrations of the other components were overestimated by the diffusive samplers. However, the agreement of the results of active and passive measurements is much better using the uptake rates developed in this study than with application of the data given by the manufacturer. Measurements with various shelters for the exposure of diffusive samplers show differences of up to 4 percent.
NTIS
Diffusivity; Samplers; Benzene; Toluene; Xylene; Ethyl Compounds; Air Quality

20010020878 Battelle Columbus Labs., OH USA
McClellan AFB SVE Off-Gas Characterization, Literature Review, and Technology Selection
Jul. 01, 1996; 82p; In English
Report No.(s): AD-A385761; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

McClellan Air Force Base (AFB) in Sacramento, California, is part of the National Environmental Technology Test Site (NETTS) program. NETTS is a joint Department of Defense (DoD) and U.S. Environmental Protection Agency (U.S. EPA) program for the evaluation and testing of environmental technologies. McClellan AFB uses soil vapor extraction (SVE) systems to remove contamination from soils. The SVE systems draw air through the pore spaces between soil particles, stripping away volatile organic compounds (VOCs) and generating a contaminated gas stream, referred to as the off-gas. The objective of the NETTS program, with respect to McClellan AFB, is to develop a treatment process to remove the VOCs from the off-gas before it is discharged into the environment. Several physical and chemical processes have been tested and demonstrated at McClellan AFB and are described in Section 2. The objective of this project is to evaluate and demonstrate a biological reactor system for treating the contaminated off-gas generated at McClellan AFB.
DTIC
Extraction; Soils; Chemical Reactions; Volatile Organic Compounds

20010020919 NASA Goddard Space Flight Center, Greenbelt, MD USA
A New Look at Aerosol Optical Models in the MODIS/AERONET ERA
Remer, Lorraine, NASA Goddard Space Flight Center, USA; Dubovik, Oleg, NASA Goddard Space Flight Center, USA; Kaufman, Yoram, NASA Goddard Space Flight Center, USA; [2000]; 1p; In English; AAAR 2000, 7-8 Nov. 2000, Saint Louis, MO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The MODerate resolution Imaging Spectroradiometer (MODIS) aboard NASA's Terra satellite will permit the first time operational satellite retrievals of atmospheric aerosols over land. The retrieval uses dynamic models of aerosol optical properties developed from ground-based sun/sky radiometer data at selected specific locations. Three recent developments argue for a reevaluation of these optical models. (1) The expansion of the AERONET sun/sky radiometer network into new geographical regions that possibly features aerosols with different properties. (2) The development of the Dubovik sky radiance inversion that now offers a more comprehensive retrieval of aerosol optical properties. (3) The launch of the Terra satellite and acquisition of MODIS data that will reveal exactly how well the models perform.
Author
Aerosols; Atmospheric Models; Optical Properties

20010020921 NASA Wallops Flight Center, Wallops Island, VA USA
The Dependence of Ocean Surface Emissivity on Wind Vector as Measured with TMR
Tran, N., NASA Wallops Flight Center, USA; Vandemark, D., NASA Wallops Flight Center, USA; Ruf, C., NASA Wallops Flight Center, USA; [2000]; 1p; In English; 1st; TOPEX/JASON, 15-17 Nov. 2000, Miami, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Global TMR brightness temperature observations at 18, 21, and 37 GHz have been colocated with near-simultaneous SeaWinds wind vector data as well as with a monthly SST climatological product. The combined data allow us to study the dependence of ocean surface emissivity, at each frequency, upon both wind speed and direction. Results show a clear two-branch wind speed dependence; weak and linear below 6 m/s with an abrupt increase in sensitivity above that point. Our analysis also shows that the nadir-view ocean surface emissivity depends on the angle between the wind direction and TMR's antenna polarization orientation.
Author
Brightness Temperature; Temperature Measurement; Microwave Radiometers; TOPEX

20010020923 NASA Goddard Inst. for Space Studies, New York, NY USA

Contribution of Changing Sources and Sinks to the Growth Rate of Atmospheric Methane Concentrations for the Last Two Decades

Matthews, Elaine, NASA Goddard Inst. for Space Studies, USA; Walter, B., Columbia Univ., USA; Bogner, J., Landfills+, Inc., USA; Sarma, D., New York Univ., USA; Portney, B., Arizona Univ., USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In situ measurements of atmospheric methane concentrations begun in the early 1980s show decadal trends, as well as large interannual variations, in growth rate. Recent research indicates that while wetlands can explain several of the large growth anomalies for individual years, the decadal trend may be the combined effect of increasing sinks, due to increases in tropospheric OH, and stabilizing sources. We discuss new 20-year histories of annual, global source strengths for all major methane sources, i.e., natural wetlands, rice cultivation, ruminant animals, landfills, fossil fuels, and biomass burning, and present estimates of the temporal pattern of the sink required to reconcile these sources and atmospheric concentrations over the time period. Analysis of the individual emission sources, together with model-derived estimates of the OH sink strength, indicates that the growth rate of atmospheric methane observed over the last 20 years can only be explained by a combination of changes in source emissions and an increasing tropospheric sink.

Author

Air Pollution; Methane; Atmospheric Composition

20010020924 NASA Goddard Inst. for Space Studies, New York, NY USA

Southern Ocean Response to NADW Changes

Rind, David, NASA Goddard Inst. for Space Studies, USA; Schmidt, G., NASA Goddard Inst. for Space Studies, USA; Russell, G., NASA Goddard Inst. for Space Studies, USA; deMenocal, P., Columbia Univ., USA; [2000]; 1p, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The possibility of North Atlantic Deep Water (NADW) changes in both past and future climates has raised the issue of how the Southern Ocean would respond. Recent experiments with the GISS coupled atmosphere-ocean model have shown that a ”bipolar see-saw” between NADW production and Antarctic Bottom Water (AABW) production in the Weddell Sea can occur in conjunction with freshening of the North Atlantic. However, this effect operates not through a slow ocean response but via a rapid atmospheric mechanism. As NADW reduces, colder temperatures in the North Atlantic, and Northern Hemisphere in general, are associated with higher surface pressure (increased atmospheric mass). Reduced mass in the Southern Hemisphere occurs in response, with lower pressure over the South Pole (an EOF #1 effect, the ”high phase” of the Antarctic Oscillation).The lower pressure is associated with stronger west winds that generate an intensified Antarctic Circumpolar Current (ACC), which leads to longitudinal heat divergence in the South Atlantic (and heat convergence in the Southern Indian Ocean). Colder temperatures in the Weddell Sea region lead to sea ice growth, increased salinity and surface water density, and greater Weddell Sea Bottom Water production. Increased poleward transport of heat occurs in the South Atlantic in conjunction with increased bottom water production, but its convergence at high latitudes is not sufficient to offset the longitudinal heat divergence due to the intensified ACC. The colder temperatures at high latitudes in the South Atlantic increase the latitudinal temperature gradient, baroclinic instability, eddy energy and eddy poleward transport of momentum, helping to maintain the lower pressure over the pole in an interactive manner. The heat flux convergence in the Indian Ocean provides a warming tendency in that region, and overall global production of AABW remains unchanged. These results have implications for the interpretation of the ice core records of the last deglaciation, but may also be relevant for changes during the Holocene and perhaps even in response to increased CO2 forcing,

Author

Antarctic Ocean; Atlantic Ocean; Deep Water; Ocean Models; Atmospheric Models; Climate Models; Climate Change

20010020925 NASA Goddard Space Flight Center, Greenbelt, MD USA

Tropospheric Response to Estimated Spectrally Discriminated Solar Forcing Over the Past 500 Years

Rind, David, NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The GISS Global Climate Middle Atmosphere Model (GCMAM) is used to investigate the effect of estimated solar irradiance changes on climate for the past 500 years. This model is employed to allow the impact of UV variations on the stratosphere to affect the troposphere via wave-mean flow interactions. Multiple experiments are done with only a total solar irradiance change (peaking at 0.2 percent from the Maunder Minimum to today); with estimated spectrally-varying irradiance changes (i.e., peak changes of 0.7 percent in the UV, 0.2 percent in the visible and near IR; and 0.07 percent in the IR greater than 1 micron); and the spectrally-varying changes in conjunction with model calculated ozone responses in the stratosphere. Results of the varying temperature patterns and radiation response will be discussed. of interest is whether the different methods of forcing the solar-in-

duced climate change produce different spatial surface temperature signatures, particularly ones that can be differentiated from greenhouse gas warming. In preliminary tests, spectrally-varying solar forcing with induced ozone changes for solar maximum minus solar minimum conditions results in a temperature signal that is primarily at high latitudes.The high latitude response arises due to solar/ozone-induced alterations in the stratospheric wind field that affect planetary wave propagation from the troposphere, and alter tropospheric advection patterns. In contrast, forcing by total solar irradiance changes produces significant response at low and subtropical latitudes as well, driven by water vapor and cloud feedbacks to the radiative perturbation.
Author
Atmospheric Models; Climate Models; Middle Atmosphere; Climate Change; Climatology; Global Warming; Greenhouse Effect

20010020927 NASA Goddard Space Flight Center, Greenbelt, MD USA
Latest Word on Retreat of the West Antarctic Ice Sheet
Bindschadler, R., NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 30 Nov. 2000, Seattle, WA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The West Antarctic ice sheet during the Last Glacial Maximum (LGM) is estimated to have been three times its present volume and to have extended close to the edge of the continental shelf Holocene retreat of this ice sheet in the Ross Sea began between 11,000 and 12,000 years ago. This history implies an average contribution of this ice sheet to sea level of 0.9 mm/a. Evidence of dateable past grounding line positions in the Ross sector are broadly consistent with a linear retreat model. However, inferred rates of retreat for some of these grounding line positions are not consistent with a linear retreat model. More rapid retreat approximately 7600 years ago and possible near-stability in the Ross Sea sector at present suggest a slow rate of initial retreat followed by a more rapid-than-average retreat during the late Holocene, returning to a near-zero rate of retreat currently. This model is also consistent with the mid-Holocene high stand observations of eustatic sea level. Recent compilation of Antarctic bed elevations (BEDMAP) illustrates that the LGM and present grounding lines occur in the shallowest waters, further supporting the model of a middle phase of rapid retreat bracketed by an older and a more recent phase of modest retreat. Extension of these hypotheses into the future make subsequent behavior of the West Antarctic ice sheet more difficult to predict but suggest that if it loses its hold on the present shallow bed, the final retreat of the ice sheet could be very rapid.
Author
Antarctic Regions; Glaciers; Sea Ice; Ice Mapping

20010020932 Minerals Management Service, Pacific OCS Region, Camarillo, CA USA
Offhore Environmental Studies Program: Fiscal Year (FY) 2002-2003. Annual Studies Plan, Pacific OCS Region *Annual Report, 2002-2003*
2000; 120p; In English; Original contains color illustrations
Report No.(s): PB2001-102464; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

Content include the following: Programmatic Overview; Introduction; Map of Leases; Projected OCS Activities; Available Information; Identification of Information Needs; Topical Areas for 2003; Literature Cited; Study Profiles; and Approved Studies. NTIS
Drilling; Pacific Ocean; Continental Shelves; Environment Effects; Offshore Energy Sources; Oil Exploration

20010020945 NASA Marshall Space Flight Center, Huntsville, AL USA
Interannual Variability of Tropical Precipitation: How Well Do Climate Models Agree With Current Satellite Estimates?
Robertson, Franklin R., NASA Marshall Space Flight Center, USA; Marshall, Susan; Roads, John; Oglesby, Robert J.; Fitzjarrald, Dan; [2001]; 1p; In English; 12th; Global Change and Climate Variations, 15-19 Jan. 2001, Albuquerque, NM, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Since the beginning of the World Climate Research Program's Global Precipitation Climatology Project (GPCP) satellite remote sensing of precipitation has made dramatic improvements, particularly for tropical regions. Data from microwave and infrared sensors now form the most critical input to precipitation data sets and can be calibrated with surface gauges to so that the strengths of each data source can be maximized in some statistically optimal sense. Recent availability of the TRMM (Tropical Rainfall Measuring Mission) has further aided in narrowing uncertainties in rainfall over die tropics and subtropics. Although climate modeling efforts have long relied on space-based precipitation estimates for validation, we now are in a position to make more quantitative assessments of model performance, particularly in tropical regions. An integration of the CCM3 using observed SSTs as a lower boundary condition is used to examine how well this model responds to ENSO forcing in terms of anomalous precipitation. An integration of the NCEP spectral model used for the Reanalysis-H effort is also examined. This integration is run with specified SSTs, but with no data assimilation. Our analysis focuses on two aspects of inter-annual variability. First are the spatial anomalies that are indicative of dislocations in Hadley and Walker circulations. Second, we consider the ability of mod-

els to replicate observed increases in oceanic precipitation that are noted in satellite observations for large ENSO events. Finally, we consider a slab ocean version of the CCM3 model with prescribed ocean beat transports that mimic upwelling anomalies, but which still allows the surface energy balance to be predicted. This less restrictive experiment is used to understand why model experiments with specified SSTs seem to have noticeably less interannual variability in precipitation than do the satellite observations.
Author
Precipitation (Meteorology); Satellite Observation; Tropical Regions; Annual Variations; Climate Models; Meteorological Satellites

20010021090

Research and development of global environment industrial technologies: Report on the results of works commissioned for research and development of technology for reducing carbon dioxide emissions, *FY 1997*

Mar. 31, 1998; 247p; In Japanese
Report No.(s): DE99-707622; ETDE/JP-99707622; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

With an objective of achieving reduction in emission of carbon dioxide and fluorocarbons, the 'research and development on technologies to reduce emission of carbon dioxide and other substances' consisting of eight projects were conducted. In research and development of waste water treatment technologies using submerged combustion, studies were performed on removal by combustion of such pollutants as organic compounds, nitrogen compounds, and sulfur compounds. The development targets were achieved on each item. In research and development related with thermal electric power generation elements, semiconductor single crystals were fabricated in order to acquire technical knowledge on thermal power generation elements intended of utilizing industrial waste heat, whereas a simulation technology for designing was developed. In other projects, research and development works were carried out on high-performance heat insulating materials, and a movable methanol reformer for fuel cells. Developments were conducted on a large pressure reducing valve, and a cooling and heating turbo heat pump for regional air conditioning facilities. Research and development were made on Peltier elements, all efforts having achieved results respectively.
NTIS
Research and Development; Industrial Wastes; Air Pollution; Pollution Control; Carbon Dioxide; Fluorocarbons

20010021094

7th annual report 1998. UN ECE convention on long-range transboundary air pollution. International cooperative programme on integrated monitoring of air pollution effects on ecosystems

Kleemola, S.; Forsius, M.; Dec. 31, 1998; 47p; In English
Report No.(s): DE99-705838; SYKE-JULK-217; ISBN 952-11-0301-9; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Integrated Monitoring Programme (ICP IM) is part of the Effects Monitoring Strategy under the UN ECE Long-Range Transboundary Air Pollution Convention. The main aim of ICP IM is to provide a framework to observe and understand the complex changes occurring in the external environment. The monitoring and prediction of complex ecosystem effects on undisturbed reference areas require a continuous effort to improve the collection and assessment of data on the international scale. At the 1997 Task Force meeting it was decided that future annual reports from ICP IM would have a more technical character. The report could include some scientific material but also short technical descriptions of recent national activities and publications. Scientific articles should preferably be published in recognized scientific journals. The responsibility for producing annual reports would still lie on the Programme Centre, but more contributions from National Focal Points were welcomed. The content of the present Annual Report reflects the decisions of the Task Force meeting. The report gives a general overview of the ICP IM activities, the present content of the ICP IM database, and presents results from assessment activities carried out by several collaborating institutes and the ICP IM Programme Centre during the programme year 1997/98. The resources of the Programme Centre have been targeted to the revision of the Programme Manual and the EU/LIFE-project 'Development of Assessment and Monitoring Techniques at Integrated Monitoring Sites in Europe', which has limited the possibilities to carry out additional evaluations of ICP IM data. Section 1 is a short status report of the ICP IM activities, content of the IM database, including the contents of the GIS database, and the present geographical coverage of the monitoring network. Section 2 contains a report on multivariate gradient analysis applied to relate chemical and biological observations (prepared by D. de Zwart, RIVM, The Netherlands). In Section 3 results from heavy metal studies on Swedish IM sites are presented (prepared by L. Bringmark, SLU, Sweden). Section 4 contains a short

summary of the final result of the EU/LIFE-project 'Development of Assessment and Monitoring Techniques at Integrated Monitoring Sites in Europe'. A separate report on the results of this project will be available in July 1998.
NTIS
Conventions; Air Pollution; Pollution Monitoring; Environment Effects; Ecosystems

20010021105
Radon determination by activated charcoal adsorption and liquid scintillation measurement
Lopez, F. O.; Canoba, A.; Dec. 31, 1998; 8p; In Spanish; In English; 4th; Spanish. Regional congress on radiological and nuclear safety
Report No.(s): DE99-604236; ARN-PI-14/98; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A passive diffusion method for the determination of radon concentration has been optimized and calibrated. The device consists of a scintillation vial containing activated charcoal, a diffusion barrier and a desiccant agent. The response to diverse atmospheric humidity and variable exposure intervals was studied. The result is a detector, which is independent of atmospheric humidity for at least (up to) 7 days of exposure. The method was compared with electret detectors (US EPA) with very satisfactory results. The advantages of this method are its simplicity, low cost, low detection limit, the total automatization of the measurement and its total independence of humidity to measure in a wide range of radon concentrations.
NTIS
Radon; Activated Carbon

20010021114 Scripps Institution of Oceanography, La Jolla, CA USA
Assessment of Climatic and Anthropogenic Impacts on the Global Carbon Cycle Constrained by Atmospheric Measurements and Remote Sensing Data ***Final Report, 1 Oct. 1996 - 31 Jul. 2000***
Keeling, Charles D., Scripps Institution of Oceanography, USA; Piper, Stephen C., Scripps Institution of Oceanography, USA; Feb. 26, 2001; 2p; In English
Contract(s)/Grant(s): NAG5-3528; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This grant aimed to establish how the global carbon cycle has responded and will respond to global change. We proposed to use models to predict measurements of atmospheric CO2 concentration and C-13/C-12 isotopic ratio, and thereby to establish how sources and sinks of atmospheric CO2 have been influenced by climatic change and human activities. As the work progressed we developed strategies involving finding regional sources and sinks of atmospheric CO2 by an inverse approach, and studying their seasonal and interannual variability.
Derived from text
Atmospheric Composition; Carbon Cycle; Climatology; Remote Sensing; Carbon Dioxide Concentration; Carbon Isotopes; Man Environment Interactions

20010021137 NASA Langley Research Center, Hampton, VA USA
Observing Tropospheric Ozone From Space
Fishman, Jack, NASA Langley Research Center, USA; Progress in Environmental Science; 2000; ISSN 1460-4094; Volume 2, No. 4, pp. 275-290; In English; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The importance of tropospheric ozone embraces a spectrum of relevant scientific issues ranging from local environmental concerns, such as damage to the biosphere and human health, to those that impact global change questions, Such is climate warming. From an observational perspective, the challenge is to determine the tropospheric ozone global distribution. Because its lifetime is short compared with other important greenhouse gases that have been monitored over the past several decades, the distribution of tropospheric ozone cannot be inferred from a relatively small set of monitoring stations. Therefore, the best way to obtain a true global picture is from the use of space-based instrumentation where important spatial gradients over vast ocean expanses and other uninhabited areas can be properly characterized. In this paper, the development of the capability to measure tropospheric ozone from space over the past 15 years is summarized. Research in the late 1980s successfully led to the determination of the climatology of tropospheric ozone as a function of season; more recently, the methodology has improved to the extent where regional air pollution episodes can be characterized. The most recent modifications now provide quasi-global (50 N) to 50 S) maps on a daily basis. Such a data set would allow for the study of long-range (intercontinental) transport of air pollution and the quantification of how regional emissions feed into the global tropospheric ozone budget. Future measurement capabilities within this decade promise to offer the ability to provide Concurrent maps of the precursors to the in situ formation of tropospheric

ozone from which the scientific community will gain unprecedented insight into the processes that control global tropospheric chemistry
Author
Global Air Pollution; Ozone; Satellite Observation; Troposphere; Ozonometry; Atmospheric Circulation; Pollution Transport

20010021174 NASA Marshall Space Flight Center, Huntsville, AL USA
Interannual Variability of the Tropical Energy Balance: Reconciling Observations and Models
Robertson, Franklin R., NASA Marshall Space Flight Center, USA; Fitzjarrald, D. E., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; Science, 29 Oct. - 2 Nov. 2000, Greenbelt, MD, USA; Sponsored by NASA Goddard Space Flight Center, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Since the beginning of the World Climate Research Program's Global Precipitation Climatology Project (GPCP) satellite remote sensing of precipitation has made dramatic improvements, particularly for tropical regions. Data from microwave and infrared sensors now form the most critical input to precipitation data sets and can be calibrated with surface gauges to so that the strengths of each data source can be maximized in some statistically optimal sense. Recent availability of the TRMM (Tropical Rainfall Measuring Mission) has further aided in narrowing uncertainties in rainfall over the tropics and subtropics. Although climate modeling efforts have long relied on space-based precipitation estimates for validation, we now are in a position to make more quantitative assessments of model performance, particularly in tropical regions. An integration of the CCM3 using observed SSTs as a lower boundary condition is used to examine how well this model responds to ENSO forcing in terms of anomalous precipitation. An integration of the NCEP spectral model used for the Reanalysis-11 effort is also examined. This integration is run with specified SSTs, but no data assimilation. Our analysis focuses on two aspects. First are the spatial anomalies that are indicative of dislocations in Hadley and Walker circulations. Second, we consider the ability of models to replicate observed increases in oceanic precipitation that are noted in satellite observations for large ENSO events. Finally, we consider a slab ocean version of the CCM3 model with prescribed ocean heat transports that mimic upwelling anomalies, but which still allows the surface energy balance to be predicted. This less restrictive experiment is used to understand why model experiments with specified SSTs seem to have noticeably less interannual variability than do the satellite precipitation observations.
Author
Annual Variations; Variability; Tropical Regions; Surface Energy

20010021187 Lembaga Penerbangan dan Antariksa Nasional, Space Meteorology Research, Atmosphere Research and Development Center, Jakarta, Indonesia
The Effects of the 1997-1998 El Nino on the Tropical Troposphere in Indonesia ***Dampak El-Nino 1997-1998 Pada Ozon Troposfer Tropis Di Indonesia***
Hidayati, Rukmi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Muziwan, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; July 2000; ISSN 0126-9754; Volume 2, No. 3, pp. 127-130; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The effects of El Nino from 1997 to 1998 on tropical tropospheric ozone was analyzed, especially in Indonesia, by using in situ data from observation of ozonesonde for the period 1996 to 1998 at Watukosek and J. Zienmke data for shift in minimum tropospheric column ozone from west to east over Pacific during October 1996, 1997, and 1998, and the comparison of the effects of 1997 to 1998 El Nino on both tropospheric ozone and water vapor in tropis area. The effects of 1997 to 1998 El Nino over Indonesia produced large increases in tropospheric ozone. These increases appear to be caused by the combination of a shift in dynamical transport and subsequent change in ozone photochemistry in the region.
Author
Ozone; Troposphere; Water Vapor; El Nino

20010021195 NATO Committee on the Challenges of Modern Society, Brussels, Belgium
NATO/CCMS Pilot Study (Meeting): Evaluation of Demonstrated and Emerging Technologies for the Treatment of Contaminated Land and Groundwater, Phase 3, 1999 Annual Report
Sep. 1999; 196p; In English, 9-14 May 1999, Angers, France; See also PB2000-103000
Report No.(s): PB2001-102142; NATO-235; EPA/542/R99/007; No Copyright; Avail: National Technical Information Service (NTIS)

The Council of the North Atlantic Treaty Organization (NATO) established the Committee on the Challenges of Modern Society (CCMS) in 1969. CCMS was charged with developing meaningful programs to share information among countries on environmental and societal issues that complement other international endeavors and to provide leadership in solving specific problems of the human environment. A fundamental precept of CCMS involves the transfer of technological and scientific solutions among

nations with similar environmental challenges. The management of contaminated land and groundwater is a universal problem among industrialized countries, requiring the use of existing, emerging, innovative, and cost-effective technologies. This document reports on the second meeting of the Phase III Pilot Study on the Evaluation of Demonstrated and Emerging Technologies for the Treatment and Clean Up of Contaminated Land and Groundwater. The USA is the lead country for the Pilot Study, and Germany and The Netherlands are the Co-Pilot countries. The first phase successfully concluded in 1991, and the results were published in three volumes. The second phase, which expanded to include newly emerging technologies, concluded in 1997; final reports documenting 52 completed projects and the participation of 14 countries were published in June 1998. Through these pilot studies, critical technical information was made available to participating countries and the world community. The Phase III study focuses on the technologies for treating contaminated land and groundwater. This Phase is addressing issues of sustainability, environmental merit, and cost-effectiveness, in addition to continued emphasis on emerging remediation technologies. The objectives of the study are to critically evaluate technologies, promote the appropriate use of technologies, use information technology systems to disseminate the products, and to foster innovative thinking in the area of contaminated land.
NTIS
Ground Water; Contamination; Pollution Control; Water Pollution; Environmental Monitoring

20010021229 Corps of Engineers, Engineer Research and Development Center, Vicksburg, MS USA
SEAM3D: A Numerical Model for Three-Dimensional Solute Transport and Sequential Electron Acceptor-Based Bioremediation in Groundwater ***Final Report***
Waddill, Dan W.; Widdowson, Mark A.; Nov. 2000; 110p; In English
Report No.(s): AD-A385443; ERDC/EL-TR-00-18; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy
The purpose of this report is (a) to describe SEAM3D, a three-dimensional numerical model for calculation of subsurface transport and biodegradation of multiple aqueous phase solutes using multiple EAs and nutrients in a fully saturated porous medium; (b)to present scenarios for verification of the SEAM3D computer code; (c) to present results of a field scale application of SEAM3D to an unconfined aquifer contaminated by gasoline; and (d) to provide detailed information on model input, output, and execution.
DTIC
Mathematical Models; Solutes; Acceptor Materials; Biodegradation; Hydrogeology; Ground Water

20010021285 National Weather Service, Morristown, TN USA
A Precipitation and Flash Flood Climatology of the WFO Morristown Hydrological Service Area
Gaffin, David M., National Weather Service, USA; Hotz, David G., National Weather Service, USA; February 2000; 32p; In English
Report No.(s): PB2000-101980; NOAA-TM-NWS-SR-204; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
As a result of the Modernization and Associated Restructuring (MAR) of the National Weather Service (NWS), a new Warning and Forecast Office (WFO) was established at Morristown, Tennessee in 1995. This new weather office is responsible for issuing public forecasts and severe weather warnings for its County Warning Area (CWA) and hydrological forecasts and warnings for its Hydrological Service Area (HSA), which includes most of east Tennessee, parts of southwest Virginia and parts of extreme southwest North Carolina. In addition, forecasters at WFO Morristown are responsible for issuing quantitative precipitation forecasts (QPF) for the river basins of the HSA, which includes all of east Tennessee and parts of southwest Virginia, western North Carolina, and northern Georgia. to support the local flash flood warning program, local forecasters have access to the INtegrated Flood Observing and Warning System (IFLOWS), which is a network of river and rain gauges which helps forecasters monitor smaller streams across the CWA which flood quickly during heavy rains. Since WFO Morristown was not a pre-established weather forecast office, little, if any, knowledge of the local and regional weather variations were known. The southern Appalachian mountains, with peaks around 6500 ft MSL, create a significant impact on the local precipitation patterns and on the local temperatures as well. to help forecasters gain a fundamental understanding of the unique forecast problems of the local area, a precipitation and flash flood climatology is compiled here for the WFO Morristown HSA, similar to the Gaffin and Lowery (1996) study of the NWSFO Memphis CWA. This climatology includes a study of the local topography, spatial distribution of normal precipitation, local flash flood statistics, frequency of heavy rain, and the synoptic patterns and sounding parameters which are typical of heavy rain events across the local area.
NTIS
Climatology; Floods; Precipitation (Meteorology); Hydrology

20010021304 Environmental Protection Agency, Small Business Div., Washington, DC USA

Environmental Management Guide for Small Laboratories

May 2000; 152p; In English

Report No.(s): PB2001-101726; EPA/223/B-00/001; No Copyright; Avail: National Technical Information Service (NTIS)

The Environmental Management Guide for Small Laboratories (Guide) is designed to help staff in small labs to better understand their responsibility for good environmental management. Its purpose is to improve environmental performance by assisting in the development and implementation of environmental management programs that meet important Federal regulatory requirements and prevent pollution. It is important to understand that for small lab environmental programs to be fully responsive, the information provided here must be supplemented by information contained in state, tribal or local regulations and by good management practices. This Guide is designed to be a good starting source.

NTIS

Environment Management; Laboratories; Regulations

20010021327 NASA Marshall Space Flight Center, Huntsville, AL USA

Use of Geostationary Satellite Data to Force Land Surface Schemes within Atmospheric Mesoscale Models

Lapenta, William M., NASA Marshall Space Flight Center, USA; Suggs, Ron, NASA Marshall Space Flight Center, USA; McNider, Richard T., Alabama Univ., USA; Jedlovec, Gary, NASA Marshall Space Flight Center, USA; Dembek, Scott R., Universities Space Research Association, USA; [2000]; 1p; In English; Multi/Hyperspectral Sensors, Measurements, Modeling and Simulation, 7-9 Nov. 2000, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A technique has been developed for assimilating GOES-derived skin temperature tendencies and insolation into the surface energy budget equation of a mesoscale model so that the simulated rate of temperature change closely agrees with the satellite observations. A critical assumption of the technique is that the availability of moisture (either from the soil or vegetation) is the least known term in the model's surface energy budget. Therefore, the simulated latent heat flux, which is a function of surface moisture availability, is adjusted based upon differences between the modeled and satellite-observed skin temperature tendencies. An advantage of this technique is that satellite temperature tendencies are assimilated in an energetically consistent manner that avoids energy imbalances and surface stability problems that arise from direct assimilation of surface shelter temperatures. The fact that the rate of change of the satellite skin temperature is used rather than the absolute temperature means that sensor calibration is not as critical. The technique has been employed on a semi-operational basis at the GHCC within the PSU/NCAR MM5. Assimilation has been performed on a grid centered over the Southeastern US since November 1998. Results from the past year show that assimilation of the satellite data reduces both the bias and RMSE for simulations of surface air temperature and relative humidity. These findings are based on comparison of assimilation runs with a control using the simple 5-layer soil model available in MM5. A significant development in the past several months was the inclusion of the detailed Oregon State University land surface model (OSU/LSM) as an option within MM5. One of our working hypotheses has been that the assimilation technique, although simple, may provide better short-term forecasts than a detailed LSM that requires significant number initialized parameters. Preliminary results indicate that the assimilation out performs the OSU/LSM as it is incorporated in MM5. Details will be presented at the symposium.

Author

Technology Assessment; Procedures; Assimilation; Atmospheric Models; Atmospheric Temperature; Heat Flux; Insolation; Surface Energy

20010021339 NASA Marshall Space Flight Center, Huntsville, AL USA

Relative Influence of Initial Surface and Atmospheric Conditions on Seasonal Water and Energy Balances

Oglesby, Robert J., Purdue Univ., USA; Marshall, Susan, NASA Marshall Space Flight Center, USA; Roads, John O., NASA Marshall Space Flight Center, USA; Robertson, Franklin R., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 12th; Global Change Studies and Climate Variations, 15-19 Jan. 2001, Albuquerque, NM, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We constructed and analyzed wet and dry soil moisture composites for the mid-latitude GCIP region of the central US using long climate model simulations made with the NCAR CCM3 and reanalysis products from NCEP. Using the diagnostic composites as a guide, we have completed a series of predictability experiments in which we imposed soil water initial conditions in CCM3 for the GCIP region for June 1 from anomalously wet and dry years, with atmospheric initial conditions taken from June 1 of a year with 'near-normal' soil water, and initial soil water from the near-normal year and atmospheric initial conditions from the wet and dry years. Preliminary results indicate that the initial state of the atmosphere is more important than the initial state of soil water determining the subsequent late spring and summer evolution of sod water over the GCIP region. Surprisingly, neither the composites or the predictability experiments yielded a strong influence of soil moisture on the atmosphere. To explore this

further, we have made runs with extreme dry soil moisture initial anomalies imposed over the GCIP region (the soil close to being completely dry). These runs did yield a very strong effect on the atmosphere that persisted for at least three months. We conclude that the magnitude of the initial soil moisture anomaly is crucial, at least in CCM3, and are currently investigating whether a threshold exists, below which little impact is seen. In a complementary study, we compared the impact of the initial condition of snow cover versus the initial atmospheric state over the western US (corresponding to the westward extension of the GAPP program follow-on to GCIP). In this case, the initial prescription of snow cover is far more important than the initial atmospheric state in determining the subsequent evolution of snow cover. We are currently working to understand the very different soil water and snow cover results.
Author
Anomalies; Climate Models; Predictions; Simulation; Snow Cover

20010021347 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Evaluation of Particulate Matter (PM) Continuous Emission Monitoring Systems (CEMS). Final Report. Volume 5: Appendices for RCA No. 1 ***Final Report***
Bivans, D.; Sep. 2000; 294p; In English
Report No.(s): PB2001-102598; EPA/454/R-00/040C; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
This final report describes an extended field demonstration of three particulate matter (PM) continuous emission monitoring systems (CEMS) at a coal-fired boiler equipped with a lime slurry scrubber and baghouse for air pollution control. The primary objectives of the field study were to: (1) demonstrate whether the PM CEMS could provide reliable and accurate data over an extended period, (2) evaluate the PM CEMS for durability, data availability, and setup/maintenance requirements, and (3) determine whether the PM CEMS satisfy all the requirements of draft PS-11 and the quality assurance (QA) criteria specified in draft Procedure 2, or determine if changes are needed in the requirements of PS-11 and/or Procedure 2. This report presents the results of the study involving two different PM CEMS technologies (light scatter and beta gauge) at the coal-fired boiler.
NTIS
Air Pollution; Pollution Control; Pollution Monitoring; Particulates; Air Sampling

20010021348 Midwest Research Inst., Kansas City, MO USA
Evaluation of Particulate Matter (PM) Continuous Emission Monitoring Systems (CEMS), Volume 1 ***Final Report***
Bivins, D.; Sep. 25, 2000; 176p; In English
Report No.(s): PB2001-102596; EPA/454/R-00/040A; No Copyright; Avail: National Technical Information Service (NTIS)
This final report describes an extended field demonstration of three particulate matter (PM) continuous emission monitoring systems (CEMS) at a coal-fired boiler equipped with a lime slurry scrubber and bag house for air pollution control. The primary objectives of the field study were to: (1) demonstrate whether the PM CEMS could provide reliable and accurate data over an extended period, (2) evaluate the PM CEMS for durability, data availability, and setup/maintenance requirements, and (3) determine whether the PM CEMS satisfy all the requirements of draft PS-11 and the quality assurance (QA) criteria specified in draft Procedure 2, or determine if changes are needed in the requirements of PS-11 and/or Procedure 2. This report presents the results of the study involving two different PM CEMS technologies (light scatter and beta gauge) at the coal-fired boiler.
NTIS
Pollution Control; Quality Control; Particulates; Air Pollution; Emission; Pollution Monitoring

20010021360 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Evaluation of Particulate Matter (PM) Continuous Emission Monitoring Systems (CEMS). Final Report. Volume 4: Appendices for RCA No. 2 ***Final Report***
Bivins, D.; Sep. 2000; 288p; In English
Report No.(s): PB2001-102599; EPA/454/R-00/040D; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
This final report describes an extended field demonstration of three particulate matter (PM) continuous emission monitoring systems (CEMS) at a coal-fired boiler equipped with a lime slurry scrubber and baghouse for air pollution control. The primary objectives of the field study were to: (1) demonstrate whether the PM CEMS could provide reliable and accurate data over an extended period, (2) evaluate the PM CEMS for durability, data availability, and setup/maintenance requirements, and (3) determine whether the PM CEMS satisfy all the requirements of draft PS-11 and the quality assurance (QA) criteria specified in draft Procedure 2, or determine if changes are needed in the requirements of PS-11 and/or Procedure 2. This report presents the results of the study involving two different PM CEMS technologies (light scatter and beta gauge) at the coal-fired boiler.
NTIS
Pollution Monitoring; Particulates; Air Pollution; Pollution Control; Air Sampling; Air Quality

20010021520 Oak Ridge National Lab., TN USA

Ethanol Demand in USA Regional Production of Oxygenate-limited Gasoline

Hadder, G. R.; Aug. 01, 2000; 88p; In English

Report No.(s): DE00-763227; ORNL/TM-2000-165; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Energy Policy Act of 1992 (the Act) outlined a national energy strategy that called for reducing the nation's dependency on petroleum imports. The Act directed the Secretary of Energy to establish a program to promote and expand the use of renewable fuels. The Office of Transportation Technologies (OTT) within the U.S. Department of Energy (DOE) has evaluated a wide range of potential fuels and has concluded that cellulosic ethanol is one of the most promising near-term prospects. Ethanol is widely recognized as a clean fuel that helps reduce emissions of toxic air pollutants. Furthermore, cellulosic ethanol produces less greenhouse gas emissions than gasoline or any of the other alternative transportation fuels being considered by DOE.

NTIS

Ethyl Alcohol; Gasoline; Energy Policy; Oxygenation

20010021616 Midwest Research Inst., Kansas City, MO USA

Evaluation of Particulate Matter (PM) Continuous Emission Monitoring Systems (CEMS), Volume 2, Appendices for Initial Correlation Tests ***Final Report***

Bivins, D.; Sep. 2000; 332p; In English

Report No.(s): PB2001-102597; EPA/454/R-00/040B; No Copyright; Avail: National Technical Information Service (NTIS)

This final report describes an extended field demonstration of three particulate matter (PM) continuous emission monitoring systems (CEMS) at a coal-fired boiler equipped with a lime slurry scrubber and bag house for air pollution control. The primary objectives of the field study were to: (1) demonstrate whether the PM CEMS could provide reliable and accurate data over an extended period, (2) evaluate the PM CEMS for durability, data availability, and setup/maintenance requirements, and (3) determine whether the PM CEMS satisfy all the requirements of draft PS-11 and the quality assurance (QA) criteria specified in draft Procedure 2, or determine if changes are needed in the requirements of PS-11 and/or Procedure 2. This report presents the results of the study involving two different PM CEMS technologies (light scatter and beta gauge) at the coal-fired boiler.

NTIS

Particulates; Pollution Control; Quality Control; Air Pollution; Pollution Monitoring

20010021617 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA

Evaluation of Particulate Matter (PM) Continuous Emission Monitoring Systems (CEMS). Final Report. Volume 5: Appendix H ***Final Report***

Bivins, D.; Sep. 2000; 204p; In English

Report No.(s): PB2001-102600; EPA/454/R-00/040E; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This final report describes an extended field demonstration of three particulate matter (PM) continuous emission monitoring systems (CEMS) at a coal-fired boiler equipped with a lime slurry scrubber and baghouse for air pollution control. The primary objectives of the field study were to: (1) demonstrate whether the PM CEMS could provide reliable and accurate data over an extended period, (2) evaluate whether the PM CEMS satisfy all the requirements of draft-PS-11 and the quality assurance (QA) criteria specified in draft Procedure 2, or determine if changes are needed in the requirements of PS-11 and/or Procedure 2. This report presents the results of the study involving two different PM CEMS technologies (light scatter and beta gauge) at the coal-fired boiler.

NTIS

Particulates; Boilers; Air Pollution; Calcium Oxides

20010021618 Denver Univ., Dept. of Chemistry and Biochemistry, Denver, CO USA

On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Year 2 ***Final Report***

Pokharel, S. S.; Bishop, G. A.; Stedman, D. H.; Jan. 2001; 46p; In English

Contract(s)/Grant(s): E-23-4

Report No.(s): PB2001-102612; Copyright; Avail: National Technical Information Service (NTIS)

The University of Denver conducted a five-day remote sensing study in the Phoenix, AZ area in the fall of 1999. The remote sensor used in this study is capable of measuring the ratios of carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NO) to carbon dioxide (CO2) in motor vehicle exhaust. From these ratios, the authors calculate mass emissions per kg (or gallon) of fuel and the percent concentrations of CO, CO2, HC and NO in motor vehicle exhaust that would be observed by a tailpipe probe, corrected for water and any excess oxygen not involved in combustion. The system used in this study was also configured

to determine the speed and acceleration of the vehicle, and was accompanied by a video system to record the license plate of the vehicle. Five days of fieldwork (November 15-19, 1999) were conducted on the uphill exit ramp from Hwy 202/Sky Harbor Blvd. Westbound to Hwy 143 Southbound in Phoenix, AZ. A database was compiled containing 18,894 records for which the State of Arizona provided make and model year information. All of these records contained valid measurements for at least CO and CO2 and 18,520 contained measurements for HC and NO.
NTIS
Remote Sensing; Exhaust Emission; Remote Sensors; Nitrogen Oxides; Hydrocarbons; Carbon Monoxide; Carbon Dioxide

20010021677 Colorado Univ., Cooperative Inst. for Research in Environmental Science, Boulder, CO USA
International Research Workshop on Integrating GIS and Environmental Modeling: Problems, Prospects, and Research Needs ***Final Report, 1 Oct. 1999 - 30 Sep. 2000***
Parks, Bradley, Colorado Univ., USA; [2001]; 3p; In English; 4th; Integrating GIS and Environmental Modeling, 2-8 Sep. 2000, Banff, Canada
Contract(s)/Grant(s): NAG5-8840
Report No.(s): CU-153-1793; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The 4th International Conference on Integrating GIS and Environmental Modeling (GIS/EM4) was convened in Banff, Canada, September 2-8, 2000 at The Banff Centre for Conferences. The meeting's purpose, like it's predecessors was to reformulate, each three to four years, the collaborative research agenda for integrating spatio-temporal analysis with environmental simulation modeling.
Derived from text
Conferences; Environment Models; Geographic Information Systems; Temporal Distribution; Research Projects; Environment Simulation

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GEOPHYSICS

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see 47 Meteorology and Climatology; and 93 Space Radiation.

20010020222 NASA Marshall Space Flight Center, Huntsville, AL USA
Performance of the Advanced Thin Ionization Calorimeter (ATIC)
Case, G., Louisiana State Univ., USA; Ellison, S., Louisiana State Univ., USA; Gould, R., Louisiana State Univ., USA; Granger, D., Louisiana State Univ., USA; Guzik, T. G., Louisiana State Univ., USA; Isbert, J., Louisiana State Univ., USA; Price, B., Louisiana State Univ., USA; Stewart, M., Louisiana State Univ., USA; Wefel, J. P., Louisiana State Univ., USA; Adams, J. H., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English, 28 Apr. - 1 May 2001, Washington, DC, USA; Sponsored by American Physical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The ATIC instrument is a balloon-borne experiment capable of measuring cosmic ray elemental spectra from 50 GeV to 100 TeV for nuclei from H to Fe with a fully active Bismuth Germanate calorimeter. Several Long Duration Balloon flights from McMurdo station, Antarctica are scheduled. The detector was tested with high energy electron, proton, and pion beams at CERN. We present results for 150 and 375 GeV protons, and 150 GeV pions and comparison with a GEANT Monte Carlo.
Author
Calorimeters; Performance Tests; Spaceborne Experiments; Balloon Flight

20010020223 NASA Marshall Space Flight Center, Huntsville, AL USA
First Flight of the Advanced Thin Ionization Calorimeter (ATIC) Balloon Experiment
Case, G., Louisiana State Univ., USA; Ellison, S., Louisiana State Univ., USA; Gould, R., Louisiana State Univ., USA; Granger, D., Louisiana State Univ., USA; Guzik, T. G., Louisiana State Univ., USA; Isbert, J., Louisiana State Univ., USA; Price, B., Louisiana State Univ., USA; Stewart, M., Louisiana State Univ., USA; Wefel, J. P., Louisiana State Univ., USA; Mock, L., Louisiana State Univ., USA; [2001]; 1p; In English, 28 Apr. - 1 May 2001, Washington, DC, USA; Sponsored by American Physical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The ATILT instrument is designed to measure the composition and energy spectra of Z = 1 to 28 cosmic rays over the energy range -10 GeV - 100 TeV. ATIC was launched as a long duration test balloon flight on 12/28/00 local time from McMurdo, Antarctica. The operations preceding and during launch went very smoothly. During the first -20 hr while the instrument remained within line of sight (LOS), a full system check out was conducted, the experiment was operated in several test configurations, and all

major tuning was completed. Preliminary analysis of the science data indicates that the overall detector system is functioning as expected. With our fully functioning analysis software we were able to monitor the data in nearly real time. Each event was reconstructed event-by-event to confirm the detector performance. The shower profiles indicate that the shower maximum location is deeper in the calorimeter for higher energy events, as expected. The energy spectra of protons, Helium nuclei, and "all particles" appear to follow power laws. Both the Si matrix and top scintillator layer of the charge module show clear charge separation for p and He. As the statistics increase, heavy nuclei charge separation will be evaluated. We will present preliminary results of the LOS data, as well as other data that will be available from the flight-data hard disk,
Author
Calorimeters; Heat Measurement; Scintillation Counters; Balloon Flight

20010020224 NASA Marshall Space Flight Center, Huntsville, AL USA
IMAGE and the Plasmasphere: Model and Data Comparison
Gallagher, D. L., NASA Marshall Space Flight Center, USA; Sandel, B., NASA Marshall Space Flight Center, USA; Ober, D., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 29 Oct. - 3 Nov. 2000, Callaway Gardens, GA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The plasmaspheric environment has been measured through in situ spacecraft since the early 1960's. With these early measurements, modeler's began to build plasmasphere models. A feature that appeared in the models that could not be directly confirmed in the measurements is a 'tail' on the dusk side that extends toward the sun. Convection flow has been assumed to give smooth azimuthal densities, except on the dusk side. The EUV images of the plasmasphere from the IMAGE spacecraft give a global picture, and show the 'tail' to be an extended region rather than density enhancements and also show the plasmasphere, particularly the plasmapause, to be much more dynamic than the models or in situ measurements have indicated. We will show some of the unexpected features and give a possible explanation for them.
Author
Images; Plasmasphere; Image Satellite; Extreme Ultraviolet Radiation

20010020269 New Hampshire Univ., Inst. for the Study of Earth, Oceans and Space, Durham, NH USA
Study of Ring Current Dynamics During Geomagnetic Storms ***Final Report, 1 Jun. 1997 - 31 May 2000***
Jordanova, Vania K., New Hampshire Univ., USA; October 2000; 4p; In English
Contract(s)/Grant(s): NAG5-7368; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This research program considered modeling the dynamical evolution of the ring current during several geomagnetic storms. The first year (6/01/1997-5/31/1998) of this successful collaborative research between the University of New Hampshire (UNH) and the University of California Los Angeles (UCLA) was supported by NASA grant NAG5-4680. The second and third years (6/01/1998-5/31/2000) were funded at UNH under NASA grant NAG5-7368. Research work at UNH concentrated on further development of a kinetic model to treat all of the important physical processes that affect the ring current ion population during storm conditions. This model was applied to simulate ring current development during several International Solar-Terrestrial Physics (ISTP) events, and the results were directly compared to satellite observations. A brief description of our major accomplishments and a list of the publications and presentations resulting from this effort are given.
Author
Magnetic Storms; Ring Currents; Geophysics; Atmospheric Models

20010020299 Ohio State Univ., Research Foundation, Columbus, OH USA
Feasibility of THz Remote Sensing for DoD Applications ***Final Report, 1 Aug. 1999-30 Apr. 2000***
De Lucia, Frank C.; Oct. 2000; 20p; In English
Contract(s)/Grant(s): F49620-99-1-0313
Report No.(s): AD-A385595; AFRL-SR-BL-TR-00-0681; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project was designed to identify applications of THz technology of potential interest to the DoD and to provide a technical introduction for DARPA personnel to the underlying scientific and technical issues. The final report begins with a discussion of the physics which governs the interactions between radiation and matter in the THz, with emphasis on the differences between low pressure gases, atmospheric pressure gases, and solids. Atmospheric propagation is considered as an example. Two specific applications were developed in more detail. The first is a concept for a point detector of gases, which is based on the absolute specificity of rotational spectra in the THz. The second is a remote detection scheme which makes use of THz/IR double resonance. The former is based on well understood science and the risks for the development of-such a program lie in the trade-offs against alternative solutions as a function of scenario. Although the details of application scenarios are not known to the authors,

it is highly likely that some of them are very favorable. The latter is a high risk/high payoff scheme whose eventual utility depends not only upon application scenario, but also on currently unknown scientific parameters.
DTIC
Remote Sensing; Defense Program; Feasibility Analysis; Extremely High Frequencies

20010020345 Space and Naval Warfare Systems Center, San Diego, CA USA
Grazing Reflectivity of the Wind-Ruffled Sea
Zeisse, C. R.; Oct. 2000; 28p; In English
Report No.(s): AD-A385663; SSC-TR-1843; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report provides a formula derived for the grazing optical reflectivity of an ocean covered by capillary waves. The formula applies to circular sources such as the Sun.
DTIC
Reflectance; Atmospheric Physics

20010020401 Computational Physics, Inc., Fairfax, VA USA
Long-Term Global Morphology of Gravity Wave Activity Using UARS Data ***Final Report, 18 Sep. - 18 Dec. 2000***
Eckermann, Stephen D., Computational Physics, Inc., USA; Dec. 18, 2000; 56p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS5-98045
Report No.(s): Rept-5090-12; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report provides a broad outline of the total body of research conducted during the past three years. We report on detailed model studies of the precise way in which infrared limb scanning satellites explicitly detect gravity waves, and use these insights to resolve earlier discrepant zonal mean estimates of gravity wave variances from satellite limb scanners. Detailed analysis of CRISTA temperature fluctuations are outlined, which provide new global information on long-wavelength stratospheric gravity waves generated by mountains, tropical convection and the mid-latitude jet stream-vortex system, as well as interactions higher in the mesosphere with the diurnal tide. The detailed insights gained from analyzing CRISTA data are applied to provide a multi-year analysis of stratospheric mountain waves over the Andes evident in MLS limb-track data. We also demonstrate for the first time that stratospheric temperature data from the CLAES instrument on UARS resolved gravity waves, and we highlight mountain wave information in a subset of these data. Final conclusions and recommendations are set forth, and the present findings are directly related to the original goals of the research contract. A full list of publications that resulted from this research is provided.
Author
Gravity Waves; Stratosphere; Mesosphere; Temperate Regions; Tropical Regions; Convection; Atmospheric Temperature

20010020524 NASA Ames Research Center, Moffett Field, CA USA
CCD-Based XRD/XRF for Determining Environmental Mineralogy on Mars
Vaniman, D. T., Los Alamos National Lab., USA; Bish, D. L., Los Alamos National Lab., USA; Blake, D. F., NASA Ames Research Center, USA; Chipera, S. J., Los Alamos National Lab., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 300-301; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche
Health effects from Martian dusts will be a concern for any manned Mars missions. Nuisance dusts plagued the Apollo astronauts, but dusts of more hazardous mineralogy, in habitats occupied by Mars astronauts weakened by a long-duration mission, may be more than a nuisance. Chemical hazards in Martian regolith attributable to S, Cl, Br, Cd, and Pb are known or strongly suspected to be present, but terrestrial studies of the health effects of dusts indicate that accurate determination of mineralogy is a critical factor in evaluating inhalation hazards. Mineral inhalation hazards such as the Group-I carcinogenic zeolite erionite, which is demonstrated to cause mesothelioma, cannot be identified by chemical analysis alone. Studies of palagonite analogs raise the possibility that erionite may occur on Mars. In addition to health effects concerns, environmental mineralogy has significant importance in resource extraction, groundwater use, and sustained agriculture. The high sulfur and chlorine content of Martian regolith will affect all of these uses, but the nature of mineralogic reservoirs for S and Cl will determine their uptake and concentration in extracted groundwater and in agricultural applications of regolith. Wet chemistry experiments planned for the Mars Environmental Compatibility Assessment (MECA) will define some of the consequences of water/soil interaction, but an understanding of the mineralogic basis for water-rock reactions is needed to understand the mechanisms of reaction and to apply the results of a few experiments to larger scales and different conditions.
Author
Mars (Planet); Mars Surface; Mineralogy; Hazards; Dust; Health

20010020750 Lembaga Penerbangan dan Antariksa Nasional, Jakarta, Indonesia

Relations Between Total Ozone and Stratosphere Temperatures in Indonesia ***Hubungan Antara Ozon Total Dan Temperatur Stratosfer Di Indonesia***

Muzirwan, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Hidayati, Rukmi, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Visa, Juniarti, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Harjana, Teguh, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; July 2000; ISSN 0126-0480; Volume 2, No. 3, pp. 130-137; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The correlation between total ozone and stratospheric temperature over Indonesia (between 6 N and 12 S, 95 E and 135 E) were analyzed through the monthly means of total ozone and stratospheric temperature at the altitude 10 mb which had been observed by NOAA 12 and 14 Satellites, during period January 1996 to December 1998 by using TeraScan Software. The results showed that correlation coefficient between total ozone and stratospheric temperature was around -0.72 (negative correlation). During the ENSO April to December 1997, it was obtained that total ozone was high, and maximum in August 1997, while the stratospheric temperature was low, and the circulation/spreading of total ozone was occurred oscillated by six month. The result was related to the semi-annual oscillation stratospheric temperature.

Author

Atmospheric Temperature; Correlation Coefficients; Ozone; Stratosphere

20010020807 Geological Survey, Washington, DC USA

Height Changes in the Epicentral Region Preceding the January 17, 1994 Northridge Earthquake. A Characterization of the Vertical-Displacement Field in Both Space and Time during the Period 1978-1989

Castle, Robert O., Geological Survey, USA; Packard, Robert F., Geological Survey, USA; Dinitz, Laura B., Geological Survey, USA; 2000; 17p; In English

Report No.(s): PB2001-101349; USGS/OFR-00-002; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Analysis of the results of repeated levelings through the epicentral region of the M(sub w)6.7, 1994 Northridge earthquake has disclosed the occurrence of differential uplift in this area that preceded the earthquake. Although the distribution of the relevant vertical-control data is somewhat sparse, in both space and time, those data that we have recovered indicate that this uplift exceeded 0.10 m and peaked 20-25 km west of the 1994 epicenter. While our data also indicate that this deformational event must have occurred during the period 1989-1989, evidence based on the character and magnitude of misclosures developed from 1987 and 1989 surveys argue that the deformation occurred largely during the period 1987-1989. The preseismic vertical-displacement field that preceded the Northridge earthquake is similar in form and, less certainly, magnitude to that which preceded the M(sub w)6.7, 1971 San Fernando earthquake; other possible, but less significant southern California analogues include the deformational events to preceded the M(sub w)5.3, 1973 Point Mugu and M(sub w)5.9, 1987 Whittier Narrows earthquakes. The small but growing number of recognized aseimic deformational episodes that preceded the small to moderate magnitude earthquakes in southern California suggest that the deployment of the dense array of continuously recording GPS receivers planned for southern California can be expected to detect and more accurately describe such events that was heretofore possible. Moreover, if the relation between the duration of these deformational anomalies and the magnitudes of any ensuing earthquakes can be much more clearly established, the near perfect temporal control on position afforded by GPS suggests that we may be on the threshold of realistic earthquake warning system.

Author

Earthquakes; Receivers; Seismology; Shock Waves

20010020920 NASA Goddard Space Flight Center, Greenbelt, MD USA

VLBI Contribution to ITRF2000

Ma, Chopo, NASA Goddard Space Flight Center, USA; [2000]; 1p; In English; ITRF2000 Meeting, 2-3 Nov. 2000, Paris, France; No Copyright; Avail: Issuing Activity; Abstract Only

The VLBI data set spanning Aug. 1919 to the present is a major constituent of ITRF2000 because of the time span, the geometric strength and the accuracy of the modeling. Formal velocity errors for the best stations are less than 0.3 mm/yr while the probable frame definition error for station velocities is approximately 0.4 mm/yr. The primary systematic errors are the troposphere and tidal loading (solid Earth and ocean). However, the scale of the VLBI TRF is probably only weakly affected because of continued improvements in the tropospheric mapping function and gradient estimation. There are some weaknesses in the spatial distribution of data, particularly in the southern hemisphere, and the quality of the mobile VLBI results is now suboptimal. The deployment of the TIGO system to Chile will improve the geometric coverage. The current state of the art of VLBI analysis will be discussed.

Author

Very Long Base Interferometry; Geometric Accuracy; Data Acquisition

20010020942 NASA Marshall Space Flight Center, Huntsville, AL USA

Correlation of Upper-Atmospheric Be-7 With Solar Energetic Particle Events

Phillips, G. W., Naval Research Lab., USA; Share, G. H., Naval Research Lab., USA; August, R. A., Naval Research Lab., USA; Tylka, A. J., Naval Research Lab., USA; Adams, J. H., Jr., Naval Research Lab., USA; Panasyuk, M. I., Moscow State Univ., Russia; Nymmik, R. A., Moscow State Univ., Russia; Kuzhevskjj, B. M., Moscow State Univ., Russia; Kulikauskas, V. S., Moscow State Univ., Russia; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Surprisingly large concentrations of radioactive Be-7 have been found in the upper atmosphere at levels of one to three orders of magnitude greater than observed in the stratosphere. This phenomenon was originally observed on the LDEF satellite which was recovered in January 1990 following a period of extremely high solar activity in the fall of 1989. We report on follow-up measurements on the Russian COSMOS and RESURS F1 spacecraft during the period of 1996 to 1999 which was a period of minimal to moderate solar activity. The Be-7 concentrations observed on these flights were down substantially from the LDEF observations but were still one to two orders of magnitude higher than stratospheric levels. A significant correlation is observed between the Be-7 activity and the combined fluence of solar energetic protons (SEP) and galactic cosmic-ray (GCR) protons. The Be-7 activity is not correlated with overall solar activity as represented by the solar x-ray flux. We discuss possible mechanisms for the solar proton correlation. However, it is likely that the Be-7 is ionized and it is unknown how this will affect the calculations. There were several large solar flares in the fall of 1989 that produced extraordinarily intense solar particle events at the Earth and record geophysical disturbances. These may have acted to increase production of Be-7 from spallation in the stratosphere and also to enhance transport to higher altitudes from the effects of heating and expansion of the upper atmosphere. Be-7 in the upper atmosphere may also have been produced directly at the Sun. Be-7 and Li-7 are produced in solar flares when accelerated alpha-particles fuse with He-4 in the solar atmosphere. Under optimistic assumptions for Sun to Earth transport and subsequent insertion into low Earth orbit, a Be-7 density of about 10(exp -7) atom/cubic cm at 310 km is estimated.

Author

Solar Activity; Solar Corpuscular Radiation; Solar Storms; Upper Atmosphere; Energetic Particles; Beryllium 7

20010021177 NASA Marshall Space Flight Center, Huntsville, AL USA

The Response of the Ionospheric Cusp to the Solar Wind Through Two Perspectives: Low Energy Charged Particle In-Situ Measurements and Low-Energy Neutral Atom Imaging

Coffey, V. N., NASA Marshall Space Flight Center, USA; Moore, T. E., NASA Goddard Space Flight Center, USA; Chandler, M. O., NASA Marshall Space Flight Center, USA; Giles, B. L., NASA Goddard Space Flight Center, USA; Craven, P. D., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 29 Oct. - 3 Nov. 2000, Callaway Gardens, GA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) mission provides a new perspective on the study of the response of the magnetosphere/ionosphere system to changing solar wind conditions, particularly the variability of ion outflow. Learning to interpret this new type of data becomes an essential step in the process of melding these results with the wealth of in-situ charged particle observations obtained over the past 25 years. In order to understand how the in-situ data correspond to and contrast with IMAGE results we will perform a conjunctive study of event data from two instruments to shed light on the coupling of the solar wind and ionosphere from these different perspectives. We will use the Low Energy Neutral Atom instrument (LENA) which images energetic neutral atom emissions from upward flowing ionospheric ions and the Thermal Ion Dynamics Instrument (TIDE) on the Polar satellite which measures in-situ ion outflow from 0.3-300 eV. Our primary goal will be to understand how comparing the imaging and in-situ perspectives can aid in the analysis of both data sets.

Author

Charged Particles; Magnetosphere-Ionosphere Coupling; Neutral Atoms; Solar Wind

20010021215 NASA Marshall Space Flight Center, Huntsville, AL USA

IMAGE EUV Observations and Modeling of the Plasmaspheric Density Trough Associated with the 24 May 2000 Geomagnetic Storm

Adrian, M.L., NASA Marshall Space Flight Center, USA; Gallagher, D. L., NASA Marshall Space Flight Center, USA; Green, J. L., NASA Marshall Space Flight Center, USA; Sandel, B. R., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; A New View of Geospace, 31 Oct. 2000, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The IMAGE EUV imager observed a plasmaspheric density trough in association with a geomagnetically active period on 24 May 2000. At EUV wavelengths, this density trough appeared as an Archimedes spiral extending from Earth's shadow to approximately 1800 MLT. We present an analysis of this density trough using simulated EUV images. Observational EUV images are subjected to edge analysis to establish the plasmapause L-shell and the location of the density trough in terms of L-shell, MLT extent, and radial width. The plasmaspheric density distribution is modeled using both static and dynamic models for the plasma-

sphere. The background plasmasphere is then numerically simulated using the 4-parameter plasmaspheric density model contained within the Global Core Plasma Model (GCPM) [Gallagher et al., 20001 and the Dynamic Global Core Plasma Model (DGCPM). Simulated EUV images of the model plasmasphere are produced once an artificial density depletion, matching the observed MLT extent and width, has been removed. Once the azimuthal extent and width of the trough have been simulated, the depth of the artificial density depletion is iteratively adjusted to produce simulated EUV images that approximate observation. The results of this analysis and discussion of possible origins for this density trough will be presented.
Author
Observation; Mathematical Models; Density Distribution; Plasmasphere; Magnetic Storms; Static Models; Extreme Ultraviolet Radiation; Dynamic Models

20010021220 NASA Marshall Space Flight Center, Huntsville, AL USA
Energy Characteristics of Auroral Electron Precipitation: A Comparison of Substorms and Pressure Pulse Related Auroral Activity
Chua, D., NASA Marshall Space Flight Center, USA; Parks, G. K., NASA Marshall Space Flight Center, USA; Brittnacher, M. J., NASA Marshall Space Flight Center, USA; Peria, W., NASA Marshall Space Flight Center, USA; Germany, G. A., NASA Marshall Space Flight Center, USA; Spann, J. F., Jr., NASA Marshall Space Flight Center, USA; Carlson, C., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The Polar Ultraviolet Imager (UVI) observes auroral responses to incident solar wind pressure pulses and interplanetary shocks such as those associated with coronal mass ejections. The arrival of a CME pressure pulse at the front of the magnetosphere results in highly disturbed geomagnetic conditions and a substantial increase in both dayside and nightside auroral precipitation. Our observations show a simultaneous brightening over broad areas of the dayside and nightside aurora in response to a pressure pulse, indicating that more magnetospheric regions participate as sources for auroral precipitation than during isolated substorms. We estimate the average energies of incident auroral electrons using Polar UVI images and compare the precipitation energies during pressure pulse associated events to those during isolated auroral substorms. Electron precipitation during substorms has average energies greater than 10 keV and is structured both in local time and magnetic latitude. For auroral intensifications following the arrival of a pressure pulse or interplanetary shock, electron precipitation is less spatially structured and has greater ux of lower energy electrons (Eave _ 7 keV) than during isolated substorm, onsets. The average energies of the precipitating electrons inferred from UVI are consistent with those measured in-situ by the FAST spacecraft. These observations quantify the differences between global and local auroral precipitation processes and will provide a valuable experimental check for models of sudden storm commencements and magnetospheric response to perturbations in the solar wind.
Author
Auroral Zones; Electron Precipitation; Sudden Storm Commencements; Precipitation (Meteorology); Polar Substorms

20010021290 National Geophysical Data Center, Boulder, CO USA
Solar-Geophysical Data Number 668, April 2000. Part 1 (Prompt Reports). Data for February and March 2000
Coffey, Helen E., Editor, National Geophysical Data Center, USA; April 2000; 176p; In English
Report No.(s): PB2000-105750; SGD-668-Pt-1; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

This paper presents Solar Geophysical Data prompt reports for February and March 2000.
CASI
Geophysics; Solar Physics; Data Processing; Solar Terrestrial Interactions

20010021299 Air Force Research Lab., Space Vehicles Directorate, Hanscom AFB, MA USA
Comparison of Ion Densities in the Topside Ionosphere at Low Latitudes and Midlatitudes With Calculations of Ionospheric Models Over a Full Solar Cycle
Rich, Frederick J., Air Force Research Lab., USA; Sultan, Peter J., Air Force Research Lab., USA; Radio Science; September - October 2000; Volume 35, No. 5, pp. 1193-1204; In English
Contract(s)/Grant(s): AF Proj. 2311
Report No.(s): AD-A384100; AFRL-VS-TR-2000-1588; Paper-1999RS002284; Copyright; Avail: Defense Technical Information Center (DTIC)

Measurements of total ion density at 840 km altitude at all latitudes in four local time sectors are available from 1987 to the present from spacecraft to the Defense Meteorological Satellite Program (DMSP). Thus all phases of the past solar cycle are represented in the data set. We present comparisons of the measurements with values obtained from climatology models of the ionosphere. The models examined are the International Reference Ionosphere (IRI) model, the Parameterized Ionospheric Model

(PIM) and the Reilly - ICED - Bent - Gallagher (RIBG) model. We show that all of the models reproduced some of the features of the observed topside ionosphere, but none of the models match all of the observations.
DTIC
Ion Density (Concentration); Earth Ionosphere; Atmospheric Models; Climatology; DMSP Satellites

20010021316 NASA Marshall Space Flight Center, Huntsville, AL USA
Radiance and Jacobian Intercomparison of Radiative Transfer Models Applied to HIRS and AMSU Channels
Garand, L., Meteorological Service of Canada, Canada; Turner, D. S., Meteorological Service of Canada, Canada; Larocque, M., Montreal Systems Consultants, Inc., Canada; Bates, J., National Oceanic and Atmospheric Administration, USA; Boukabara, S., Atmospheric and Environmental Research, Inc., USA; Brunel, P., Centre de Meteorologie Spatiale, France; Chevallier, F., European Centre for Medium-Range Weather Forecasts, UK; Deblonde, G., Montreal Systems Consultants, Inc., Canada; Engelen, R., Colorado State Univ., USA; Hollingshead, M., Raytheon Co., USA; [2000]; 2p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The goals of this study are the evaluation of current fast radiative transfer models (RTMs) and line-by-line (LBL) models. The intercomparison focuses on the modeling of 11 representative sounding channels routinely used at numerical weather prediction centers: 7 HIRS (High-resolution Infrared Sounder) and 4 AMSU (Advanced Microwave Sounding Unit) channels. Interest in this topic was evidenced by the participation of 24 scientists from 16 institutions. An ensemble of 42 diverse atmospheres was used and results compiled for 19 infrared models and 10 microwave models, including several LBL RTMs. For the first time, not only radiances, but also Jacobians (of temperature, water vapor and ozone) were compared to various LBL models for many channels. In the infrared, LBL models typically agree to within 0.05-0.15 K (standard deviation) in terms of top-of-the-atmosphere brightness temperature (BT). Individual differences up to 0.5 K still exist, systematic in some channels, and linked to the type of atmosphere in others. The best fast models emulate LBL BTs to within 0.25 K, but no model achieves this desirable level of success for all channels. The ozone modeling is particularly challenging, In the microwave, fast models generally do quite well against the LBL model to which they were tuned. However significant differences were noted among LBL models, Extending the intercomparison to the Jacobians proved very useful in detecting subtle and more obvious modeling errors. In addition, total and single gas optical depths were calculated, which provided additional insight on the nature of differences. Recommendations for future intercomparisons are suggested.
Author
Advanced Microwave Sounding Unit; High Resolution; Infrared Instruments; Radiance; Radiative Transfer; Remote Sensing; Channels (Data Transmission)

20010021317 NASA Marshall Space Flight Center, Huntsville, AL USA
The Storm-Time Plasmasphere as Seen by the Extreme Ultraviolet (EUV) Imager on the IMAGE Spacecraft
Gallagher, Dennis L., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Many years of ground and space observations of the plasmasphere have established a basic understanding of the physics of these plasmas in the inner magnetosphere. However, many questions remain. The EUV Instrument on the IMAGE spacecraft is now providing the first ever global pictures of thermal helium in the plasmasphere. Detached plasma, the sunward extending convection tail, a night-time interior plasmaspheric density cavity, and strong azimuthal plasmaspheric structures are all being revealed. What are the properties of these structures? How do they evolve? What is their relationship to magnetic storms and other plasma populations? These are some of the questions that define the state of plasmaspheric physics, to which IMAGE is now contributing answers. The graphic evidence and preliminary analysis of these features will be presented and discussed.
Author
Extreme Ultraviolet Radiation; Plasmasphere; Image Satellite; Plasmas (Physics); Magnetic Storms

20010021318 NASA Marshall Space Flight Center, Huntsville, AL USA
IMAGE Software Suite
Gallagher, Dennis L., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The IMAGE Mission is generating a truely unique set of magnetospheric measurement through a first-of-its-kind complement of remote, global observations. These data are being distributed in the Universal Data Format (UDF), which consists of data, calibration, and documentation. This is an open dataset, available to all by request to the National Space Science Data Center (NSSDC) at NASA Goddard Space Flight Center. Browse data, which consists of summary observations, is also available through the NSSDC in the Common Data Format (CDF) and graphic representations of the browse data. Access to the browse data can

be achieved through the NSSDC CDAWeb services or by use of NSSDC provided software tools. This presentation documents the software tools, being provided by the IMAGE team, for use in viewing and analyzing the UDF telemetry data. Like the IMAGE data, these tools are openly available. What these tools can do, how they can be obtained, and how they are expected to evolve will be discussed.
Author
Software Development Tools; Image Satellite; NASA Space Programs; Space Missions

20010021589 NASA Marshall Space Flight Center, Huntsville, AL USA
The Immediate Auroral Response to Interplanetary Shock Event
Spann, James F., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The auroral response to the dynamic solar wind is generally thought of as having a time lag of several minutes to hours. However, with the simultaneous and continuous availability of global images and solar wind data for several hours has enabled the direct and immediate response of the aurora to be observed. Localized as well as large scale phenomena have been observed nearly simultaneously with sudden variances in the solar wind density and velocity. A review of the historical and recent progress in this area of research will be presented.
Author
Interplanetary Medium; Auroras; Solar Wind Velocity

20010021590 NASA Marshall Space Flight Center, Huntsville, AL USA
Behavior of the Aurora During 10-12 May, 1999 When The Solar Wind Nearly Disappeared
Parks, G., Washington Univ., USA; Brittnacher, M., Washington Univ., USA; Chua, D., Washington Univ., USA; Fillingim, M., Washington Univ., USA; Germany, G., Alabama Univ., USA; Spann, J., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The aurora was still active with occasional pseudobreakup events when the solar wind density diminished to unusually small densities (0.2 cc -1) during May 10-12, 1999. The aurora was observed at high magnetic latitudes indicating that the electron precipitation source moved northward as the geomagnetic activity decreased. The events we have studied indicate that the solar wind density alone is not the primary parameter that controls the auroral activity. The weak auroral activity was observed with 150 nT magnetic bays and when the interplanetary magnetic field (IMF) Bz was small and positive resulting in small _ parameter. A new auroral feature was observed on May 11, 1999, between 0900-2000 UT. The electron precipitation was energetic, uniform, and covered the region commonly identified as the polar cap. This precipitation lasted for more than 10 hours and was stable over time scales of tens of minutes. On May 12, as the solar wind began to recover, a prolonged period of dayside activity occurred and was followed by a typical aurora at 0500 UT.
Author
Auroras; Solar Wind; Geomagnetism

20010021591 NASA Marshall Space Flight Center, Huntsville, AL USA
Electron and Proton Auroral Dynamics
Mende, S. B., California Univ., USA; Frey, H. U., California Univ., USA; Gerard, J. C., Liege Univ., Belgium; Hubert, B., Liege Univ., Belgium; Fuselier, S., Lockheed Martin Palo Alto Research Lab., USA; Spann, J. F., Jr., NASA Marshall Space Flight Center, USA; Gladstone, R., Southwest Research Inst., USA; Burch, J. L., Southwest Research Inst., USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Data from the Wide-band Imaging Camera (WIC) sensitive to far ultraviolet auroras and from the Spectrographic Imager (SI) channel SI12, sensitive to proton precipitation induced Lyman alpha were analyzed during a high altitude orbit segment of the IMAGE spacecraft. This segment began during the expansive phase of a substorm. The aurora changed into a double oval configuration, consisting of a set of discrete pole-ward forms and a separate diffuse auroral oval equatorwards, Although IMF Bz was strongly southward considerable activity could be seen poleward of the discrete auroras in the region that was considered to be the polar cap. The SI12 Doppler shifted Lyman alpha signature of precipitating protons show that the proton aurora is on the equatorward side of the diffuse aurora. In the following several hours the IMF Bz field changed signed. Although the general character of the proton and electron aurora did not change, the dayside aurora moved equatorward when the Bz was negative and more bright aurora was seen in the central polar cap during periods of positive Bz.
Author
Protons; Electrons; Far Ultraviolet Radiation; Imaging Techniques; Auroral Zones; Satellite Orbits

20010021670 National Oceanic and Atmospheric Administration, Space Environment Center, Boulder, CO USA

Polar Orbiting Environmental Satellite Space Environment Monitor, 2, Instrument Descriptions and Archive Data Documentation

Evans, D. S., National Oceanic and Atmospheric Administration, USA; Greer, M. S., National Oceanic and Atmospheric Administration, USA; December 2000; 136p; In English

Report No.(s): PB2001-102018; NOAA-TM-OAR-SEC-93; Copyright; Avail: National Technical Information Service (NTIS)

Beginning with NOAA-15, an upgraded Space Environment Monitor (SEM-2) is included in the POES satellite instrument complement. This document contains the technical descriptions of the improved Total Energy Detector and upgraded Medium Energy Proton and Electron Detector. A thorough description of the content of the archive data tape and all the information required to convert the archived data to usable information is given. The description of the archive file format provides the information needed to read and unpack the data from the file. Appendices provide examples of 'C' and FORTRAN programs that read the archive file and technical information regarding the instruments and conversion of raw data to physical units.

NTIS

Aerospace Environments; Environmental Monitoring; Satellite Instruments

47
METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20010019835 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Structure and Evolution of Extratropical Cyclones, Fronts, Jet Streams, and the Tropopause in the GEOS General Circulation Model

Conaty, A. L., General Sciences Corp., USA; Jusem, J. C., General Sciences Corp., USA; Takacs, L., General Sciences Corp., USA; Keyser, D., Albany Univ., USA; Atlas, R., NASA Goddard Space Flight Center, USA; Oct. 26, 2000; 35p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS5-32332; NAG5-7469; Copyright; Avail: Issuing Activity

The realism of extratropical cyclones, fronts, jet streams, and the tropopause in the Goddard Earth Observing System (GEOS) General Circulation Model (GCM), implemented in assimilation and simulation modes, is evaluated from climatological and case-study perspectives using the GEOS-1 reanalysis climatology and applicable conceptual models as benchmarks for comparison. The latitude-longitude grid spacing of the datasets derived from the GEOS GCM ranges from 2 deg x 2.5 deg to 0.5 deg x 0.5 deg. Frontal systems in the higher resolution datasets are characterized by horizontal potential temperature gradients that are narrower in scale and larger in magnitude than their lower-resolution counterparts, and various structural features in the Shapiro-Keyser cyclone model are replicated with reasonable fidelity at 1 deg x 1 deg resolution. The remainder of the evaluation focuses on a three-month Northern Hemisphere winter simulation of the GEOS GCM at 1 deg x 1 deg resolution. The simulation realistically reproduces various large-scale circulation features related to the North Pacific and Atlantic jet streams when compared with the GEOS-1 reanalysis climatology, and conforms closely to a conceptualization of the zonally averaged troposphere and stratosphere proposed originally by Napier Shaw and revised by Hoskins. An extratropical cyclone that developed over the North Atlantic Ocean in the simulation features a long cold front, a short warm front, and a narrowing warm sector, suggestive of the Norwegian cyclone model, and the evolution of the dynamic tropopause features a cyclonic wrapup, reminiscent of the LC2 life cycle proposed by Thorncroft et al. Use of Vis5D visualization software portrays the interaction between a deep tropopause fold and the surface cyclone, and further reveals that in three dimensions the tropopause fold exhibits a vortical structure. The correspondence of the simulated surface and tropopause evolutions to the Norwegian cyclone model and to the LC2 life cycle, respectively, is related to the position of the developing cyclone relative to upper-level jets identified in the time-mean and instantaneous flow fields. This article concludes with the enumeration of several research opportunities that may be addressed through the use of state-of-the-art GCMs that possess sufficient resolution to represent mesoscale phenomena and processes within extratropical baroclinic systems.

Author

Cyclones; Meteorology; Cold Fronts; Warm Fronts; Jet Streams (Meteorology)

20010019991 NASA Goddard Space Flight Center, Greenbelt, MD USA

Vertical Structure of Stratiform Rain During TEFLUN-B and TRMM-LBA as Derived From an Airborne Radar Perspective

Heymsfield, Gerald M., NASA Goddard Space Flight Center, USA; Tian, L., NASA Goddard Space Flight Center, USA; Heymsfield, A., NASA Goddard Space Flight Center, USA; Brandes, E., NASA Goddard Space Flight Center, USA; [2000]; 1p; In English; Special TRMM Field Campaign Session, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA aircraft instrumented with airborne radars overflew a number of stratiform rain systems during the Texas and Florida Underflights Experiment-B TEFLUN-B) and TRMM-LBA (LBA). TEFLUN-B was conducted near Melbourne Florida during late Summer 1998 for validation of the TRMM satellite. LBA was conducted in Rondonia, Brazil in the Amazon region. Key in these campaigns were the ER-2 and DC-8 aircraft, as well as extensive ground-validation networks including the NCAR S-band (S-POL) polarization radar and University of North Dakota Citation II in situ microphysics measurements. This paper compares the vertical structure of precipitation and vertical motions for four cases: 5 September 1998 and 13 August 1998 during TEFLUN-B and 17 February 1999 and 21 February 1999 during LBA. Both these stratiform systems were within close range of the S-POL radar, and were sampled with downlooking radars and radiometers on the ER-2 (and DC-8 during LBA). Emphasis in the paper is on statistics of the vertical hydrometeor profiles, and their relation to the vertical velocity structure deduced from the ER-2 Doppler Radar (EDOP) measurements. These profiles are used to identify whether growth regions exist as would be expected with mesoscale updrafts often associated with stratiform regions. Finally, rain rates in the stratiform rain derived from EDOP and S-POL are compared.

Author

Amazon Region (South America); Mesoscale Phenomena; Vertical Air Currents; Vertical Motion; Rain; Tropical Meteorology

20010019992 NASA Goddard Space Flight Center, Greenbelt, MD USA

Latent Heating Retrievals Using the TRMM Precipitation Radar: A Multi-Seasonal Study

Tao, W.-K., NASA Goddard Space Flight Center, USA; Lang, S., NASA Goddard Space Flight Center, USA; Meneghini, B., NASA Goddard Space Flight Center, USA; Halverson, J., NASA Goddard Space Flight Center, USA; Johnson, R., NASA Goddard Space Flight Center, USA; Simpson, J., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Goddard Convective-Stratiform Heating (CSH) algorithm is used to retrieve profiles of latent heating over the global tropics for a period of several months using TRMM precipitation radar data. The seasonal variation of heating over the tropics is then examined. The period of interest also coincides with several TRMM field campaigns that recently occurred over the South China Sea in 1998 (SCSMEX), Brazil in 1999 (TRMM-LBA), and in the central Pacific in 1999 (KWAJEX). Sounding diagnosed Q1 budgets from these experiments could provide a means of validating the retrieved profiles of latent heating from the CSH algorithm.

Author

Convective Heat Transfer; Tropical Regions; Radar Data; Precipitation (Meteorology); Meteorological Radar; Atmospheric Heating

20010020001 NASA Marshall Space Flight Center, Huntsville, AL USA

Atlantic Tropical Cyclone Monitoring with AMSU-A: Estimation of Maximum Sustained Wind Speeds

Spencer, Roy, NASA Marshall Space Flight Center, USA; Braswell, William D., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The first Advanced Microwave Sounding Unit temperature sounder (AMSU-A) was launched on the NOAA-15 satellite on 13 May 1998. The AMSU-A's higher spatial and radiometric resolutions provide more useful information on the strength of the middle and upper tropospheric warm cores associated with tropical cyclones than have previous microwave temperature sounders. The gradient wind relationship suggests that the temperature gradient near the core of tropical cyclones increases nonlinearly with wind speed. We recast the gradient wind equation to include AMSU-A derived variables. Stepwise regression is used to determine which of these variables is most closely related to maximum sustained winds (V(sub max)). The satellite variables investigated include the radially averaged gradients at two spatial resolutions of AMSU-A channels 1 through 10 T(sub b) data (delta(sub r)T(sub b)), the squares of these gradients, a channel 15 based scattering index (SI-89), and area averaged T(sub b). Calculations of Tb and delta(sub r)T(sub b) from mesoscale model simulations of Andrew reveal the effects of the AMSU spatial sampling on the cyclone warm core presentation. Stepwise regression of 66 AMSU-A terms against National Hurricane Center (NHC) V(sub max) estimates from the 1998 and 1999 Atlantic hurricane season confirms the existence of a nonlinear relationship

between wind speed and radially averaged temperature gradients near the cyclone warm core. of six regression terms, four are dominated by temperature information, and two are interpreted as correcting for hydrometeor contamination. Jackknifed regressions were performed to estimate the algorithm performance on independent data. For the 82 cases that had in situ measurements of V(sub max), the average error standard deviation was 4.7 m/s. For 108 cases without in situ wind data, the average error standard deviation was 7.5 m/s. Operational considerations, including the detection of weak cyclones and false alarm reduction are also discussed.
Author
Advanced Microwave Sounding Unit; Surveillance; Temperature Gradients; Meteorological Radar

20010020066 NASA Goddard Space Flight Center, Greenbelt, MD USA
A10 Convective Systems Observed During TRMM Field Campaigns
Adler, Robert, NASA Goddard Space Flight Center, USA; [2000]; 1p; In English; Tropical Rainfall Measuring Mission (TRMM): Status of Precipitation Estimates on Monthly and Finer time Scales, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Tropical Rainfall Measuring Mission (TRMM) will have completed three years in orbit at the time of the Fall 2000 AGU meeting. A summary of research highlights will be presented focusing on application of TRMM data to topics ranging from climate analysis, through improving forecasts to microphysical research. Surface rainfall estimates based on different instruments on TRMM currently differ by 20%. The difference is not surprising considering the different type of observations available for the first time with TRMM through both the passive and active microwave sensors. Resolving that difference will strengthen the validity and utility of ocean rainfall estimates and is the topic of ongoing research utilizing various facets of the TRMM validation and field experiment programs. The TRMM rainfall estimates will be intercompared among themselves and with other estimates, including those of the standard, monthly Global Precipitation Climatology Project (GPCP) analysis. The GPCP analysis agrees roughly in magnitude with the passive microwave-based TRMM estimates which is not surprising considering GPCP over-ocean estimates are based on passive microwave observations. A summary of validation of TRMM estimates against raingauge and radar/raingauge analyses will be presented. At finer time scales results of merging TRMM, other passive microwave observations, and geosynchronous estimates into a 3-hour time resolution analysis will be described.
Author
Convection; Precipitation (Meteorology); Rain; Atmospheric Moisture

20010020067 NASA Goddard Space Flight Center, Greenbelt, MD USA
Kinematic and Moisture Environments of Convective Systems During TRMM-LBA: Preliminary Sounding Analyses
Halverson, J. B., Maryland Univ. Baltimore County, USA; Rickenbach, T., Maryland Univ. Baltimore County, USA; Pierce, H., NASA Goddard Space Flight Center, USA; Roy, B., NASA Goddard Space Flight Center, USA; Ferreira, R. N., Universities Space Research Association, USA; Fisch, G., Instituto Nacional de Pesquisas Espacias, Brazil; [2000]; 1p; In English; Convective Systems Observed during TRMM Field Campaigns, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Preliminary radiosonde data are analyzed from a four station observation network that operated during TRMM-LBA. These data, which are undergoing quality control, are used to construct mean vertical profiles and time-height sections of u- and v- wind components, and also filtered time series analyses of layer mean relative humidity. Trends are identified in the humidity data which appear similar at all sites, and correlate well with multi-week changes in wind regime identified by Rickenbach et al. Higher-frequency modes of variation (3-5 day) also occur in the humidity and upper tropospheric winds and are spatially coherent among the four locations. The causes of these variations are explored, including interactions among upper tropospheric synoptic features. Finally, an attempt is made to relate the general morphology of convective systems to the vertical shear structure and thermodynamic changes that accompany contrasting wind regimes.
Author
Convection; Humidity; Moisture; Thermodynamics; Tropical Meteorology

20010020068 NASA Goddard Space Flight Center, Greenbelt, MD USA
Evolution and Mean Properties of Convective Systems in Southwestern Amazonia During TRMM-LBA
Rickenbach, Thomas M., NASA Goddard Space Flight Center, USA; Ferreira, Rosana Nieto, NASA Goddard Space Flight Center, USA; Halverson, Jeffrey B., NASA Goddard Space Flight Center, USA; deSilvaDias, Maria A. F., NASA Goddard Space Flight Center, USA; [2000]; 2p; In English; TRMM Field Campaigns, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

During the wet season TRMM field campaign in Rondonia, Brazil, a variety of convective systems were sampled by radar, sounding, and geostationary satellite for a 60 day period in early 1999. Local variations in the local wind and humidity field have been attributed in part by this study to synoptic scale phenomena, most conspicuously the establishment of stationary frontal systems penetrating into the tropics. These baroclinic systems induced periodic episodes low level moist, westerly flow across Rondonia during the experiment. This flow feature may be an important component of the South American climate system by playing a role in maintaining the South Atlantic Convergence Zone, which was active during these local westerly wind events. It is therefore important to understand the differences in mesoscale properties of convective systems between the westerly wind periods and intervening easterly wind periods. Differences in shear and moisture characteristics (Halverson et al. 2000, this meeting) are compared to structural and life-cycle characteristics of convective systems in Rondonia. Data from ground based radar and geostationary satellite provide a view of the evolution of the vertical structure and horizontal morphology of several large mesoscale convective systems in each regime. Preliminary statistics on the diurnal variation of precipitation intensity, areal coverage, and cloud top area are presented. Results suggest that long-lived, shallow convective systems with a large stratiform component of precipitation are characteristic of the westerly wind periods. A goal of this study is to establish a basis for which to parameterize the mesoscale effects of convection on large scale features of the South American climate system.
Author
Amazon Region (South America); Diurnal Variations; Mesoscale Phenomena; Tropical Regions; Convection Clouds; Convective Heat Transfer

20010020069 NASA Goddard Space Flight Center, Greenbelt, MD USA
Numerical Simulations of TRMM LBA, TOGA, COARE, GATE, ARM and PRESTORM Convective Systems: Sensitivity tests on Microphysical Processes
Tao, W.-K., NASA Goddard Space Flight Center, USA; Wang, Y., NASA Goddard Space Flight Center, USA; Lang, S., NASA Goddard Space Flight Center, USA; Ferrier, B., NASA Goddard Space Flight Center, USA; Simpson, J., NASA Goddard Space Flight Center, USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The 3D Goddard Cumulus Ensemble (GCE) model was utilized to examine the behavior and response of simulated deep tropical cloud systems that occurred over the west Pacific warm pool region, the Atlantic ocean and the central USA. The periods chosen for simulation were convectively active periods during TOGA-COARE (February 22 1993, December 11-17, 1992; December 19-28, February 9-13, 1993), GATE (September 4, 1974), LBA (January 26 and February 23, 1998), ARM (1997 IOP) and PRESTORM (June 11, 1985). We will examine differences in the microphysics for both warm rain and ice processes (evaporation /sublimation and condensation/ deposition), Q1 (Temperature), Q2 (Water vapor) and Q3 (momentum both U and V) budgets for these three convective events from different large-scale environments. The contribution of stratiform precipitation and its relationship to the vertical shear of the large-scale horizontal wind will also be examined. New improvements to the GCE model (i.e., microphysics: 4ICE two moments and 3ICE one moment; advection schemes) as well as their sensitivity to the model results will be discussed. Preliminary results indicated that various microphysical schemes could have a major impact on stratiform formation as well as the size of convective systems. However, they do not change the major characteristics of the convective systems, such as: arc shape, strong rotational circulation on both ends of system, heavy precipitation along the leading edge of systems.
Author
Convection; Simulation; Atmospheric Models; Environment Models; Cumulus Clouds; Tropical Meteorology

20010020216 NASA Marshall Space Flight Center, Huntsville, AL USA
Confirmation of NLDN Long Range Strike Locations with LIS Observations
Boeck, William, Niagara Univ., USA; Boccippio, Dennis, NASA Marshall Space Flight Center, USA; Goodman, Steve, NASA Marshall Space Flight Center, USA; Cummins, Kenneth, Global Atmospherics, Inc., USA; Cramer, John, Global Atmospherics, Inc., USA; [2000]; 1p; In English, 16 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This study compares the lightning locations reported by the National Lightning Detection Network (NLDN) with the lightning locations determined by the Lightning Imaging Sensor (LIS). The NLDN system identifies the rf signature of cloud-to-ground lightning. The LIS data is the top level of a hierarchy of optical data objects. The centroid and timing of each LIS lightning activity center are compared with each flash in a subset of the NLDN long range lightning location data in a portion of the Atlantic Ocean and the Caribbean Sea consisting of those locations more than 625 km from any sensor. This subset is produced by analyzing each reported NLDN location to determine if that location is within the LIS field of view at the time of the reported flash. The Tropical Rainfall Measuring Mission Satellite (TRMM) orbit limits the cross-sensor comparison to tropical and sub-tropical regions. Because the rf-detection system depends on ionospheric propagation conditions, a separate analysis was made for day-

light conditions at both source and sensor as well as nighttime at both places. A full year of data is compared to provide an adequate sample of each data set. Confirmation of lightning in the general location of the NLDN report is established when LIS detected one or more centers of lightning activity within a 2 degree radius from the NLDN location.
Author
Detection; Imaging Techniques; Lightning; Position (Location)

20010020262 Commerce One Global Services, Laurel, MD USA
Alternative Approaches to Mission Control Automation at NASA's Goddard Space Flight Center
Rackley, Michael, NASA Goddard Space Flight Center, USA; Cooter, Miranda, Commerce One Global Services, USA; Davis, George, Commerce One Global Services, USA; Mackey, Jennifer, Commerce One Global Services, USA; [2001]; 6p; In English; FLAIRS Conference, 21-23 May 2001, Key West, FL, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

To meet its objective of reducing operations costs without incurring a corresponding increase in risk, NASA is seeking new methods to automate mission operations. This paper examines the state of the art in automating ground operations for space missions. A summary of available technologies and methods for automating mission operations is provided. Responses from interviews with several space mission FOTs (Flight Operations Teams) to assess the degree and success of those technologies and methods implemented are presented. Mission operators that were interviewed approached automation using different tools and methods resulting in varying degrees of success - from nearly completely automated to nearly completely manual. Two key criteria for successful automation are the active participation of the FOT in the planning, designing, testing, and implementation of the system and the relative degree of complexity of the mission.
Author
Space Missions; Space Flight; Automatic Control; Ground Operational Support System

20010020759 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
National Weather Service Modernization and NOAA Fleet Issues. Statement of Joel C. Willemssen, Director, Civil Agencies Information Management Division and L. Nye Stevens, Director Federal Management and Workforce Issues General Government Division
Feb. 24, 1999; 18p; In English
Report No.(s): PB2001-101612; GAO/T-AIMD/GGD-99-97; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We appreciate the opportunity to join in today's hearing to discuss our work in two areas under the responsibility of the National Oceanic and Atmospheric Administration (NOAA), a component of the Department of Commerce. At your request, we will first discuss the status of the National Weather Service (NWS) systems modernization and then address the most cost-effective alternatives for acquiring NOAA's marine data. Last month, we continued to designate the NWS systems modernization effort as high-risk information technology area and the NOAA fleet as an additional major management challenge confronting the Department of Commerce.
NTIS
Weather Forecasting; Information Systems; Meteorological Services

20010020922 NASA Wallops Flight Center, Wallops Island, VA USA
An Altimeter Wind Speed Model Using Both Radar Backscatter and Significant Wave Height
Vandemark, D., NASA Wallops Flight Center, USA; Gourrion, J., NASA Wallops Flight Center, USA; Bailey, S., NASA Wallops Flight Center, USA; Chapron, B., NASA Wallops Flight Center, USA; [2000]; 1p; In English; 1st; TOPEX/JASON, 15-17 Nov. 2000, Miami, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The development and validation of a new altimeter wind speed model will be presented. This algorithm provides a direct mapping of TOPEX-measured backscatter and significant wave height to 10 m wind speed. A large scatterometer/altimeter crossover data set was assembled to develop the routine and several large ancillary data sets have been assembled for validation purposes. Validation results suggest that this two input routine provides marginal, yet measurable improvements over the standard single-parameter MCW algorithm.
Author
Altimeters; Scatterometers; Wind Velocity

20010020944 NASA Marshall Space Flight Center, Huntsville, AL USA

Diagnosing Tropical Divergent Circulations From Satellite-Derived Diabatic Forcing and Variational Integral Constraints

Robertson, Franklin R., NASA Marshall Space Flight Center, USA; Lu, H.-I.; [2001]; 1p; In English; 5th; Integrated Observing Systems, 15-19 Jan. 2001, Albuquerque, NM, USA; Sponsored by American Meteorological Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Large-scale divergent circulations are part of the atmospheric dynamic response to diabatic heating from condensation, radiative processes, and surface energy fluxes. Vertical motion and the associated divergent wind is thus intimately tied to the hydrologic cycle and the global beat balance. Despite its importance, the divergent circulation is too small in comparison to the rotational flow to measure directly with any accuracy. Vertical motions are recovered diagnostically from reanalyses and, as such, are subject to shortcomings in model physics, numerics, and data availability. While reanalysis estimates of tropical divergent circulations are much improved over those from the Global Weather Experiment, there are still substantial differences between products from operational centers. This is because these circulations are still forced largely by model physics and only secondarily by observations. In order to produce a refined estimate of tropical divergence and its interannual variability we have used a number of remotely-sensed data sets along with variational constraints to improve upon reanalysis estimates. Among these are: precipitation from SSM/I and GPCP, TOVS Path-A vertical cloud distributions; ISCCP radiative cooling rates; TOA radiative fluxes from ERBS, surface radiative fluxes from the SRB project, and surface latent and sensible flux estimates from SSM/I. The TOVS Path-A data constrain the divergent outflow in precipitating regions to have the same vertical structure as observed cloudiness. Using integral constraints for moisture, heat, and mass balance, we retrieve consistent divergent wind flows. We examine the ability of this type analysis to capture regional details of ENSO related perturbations to the divergent wind and associated tropical energy balance. Precipitation from satellite is found to be the major constraint in supplying this horizontal structure. We also consider the ability of this analysis to quantify integrated (land vs. ocean) fluctuations in the global monsoonal flow and energy balance. This depends, of course, on the error characteristics of the data constraints. Some estimate of these properties and their relative importance is provided.

Author

Climatology; Tropical Regions; Variability; Vertical Distribution; Atmospheric Circulation; Tropical Meteorology

20010021171 NASA Marshall Space Flight Center, Huntsville, AL USA

Tornadic Supercells on May 3, 1999 Viewed from Space During an Overpass of the NASA TRMM Observatory

Goodman, Steven J., NASA Marshall Space Flight Center, USA; Buechler, Dennis, NASA Marshall Space Flight Center, USA; Driscoll, Kevin, NASA Marshall Space Flight Center, USA; Burgess, Donald W., National Oceanic and Atmospheric Administration, USA; Magsig, Michael A., Oklahoma Univ., USA; [2000]; 1p; In English; Science, 29 Oct. - 2 Nov. 2000, Greenbelt, MD, USA; Sponsored by NASA Goddard Space Flight Center, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA Tropical Rainfall Measuring Mission (TRMM) Observatory made an overpass during the Central Oklahoma tornado outbreak at approximately 04:00 LTC on 4 May, 1999 (23:00 CDT on 3 May). At the time of the TRMM snapshot there were 25 individual storms in Oklahoma that could be identified and cross-correlated between the TRMM measurements and the Twin Lakes (KTLX) NEXRAD radar. of these, six were significant supercells that could be trended for 30-min prior and subsequent to (1 hr total) the TRMM overpass. Thus, we are able to provide a context for the TRMM snapshot with respect to each individual supercell's recent growth, decay, and severe weather producing history. The most vigorous and electrically active storm at the time of the overpass is the Stroud, OK supercell whose F3 tornado ended only about 10 minutes earlier. Another F3 tornado north of Crescent, OK (- 150 km west of Stroud) is on the ground and a supercell with a developing, yet still weak mesocyclone is just south of the Stroud storm. This latter storm produces an F1 tornado an hour later near Sapulpa, OK. The objective of this study is to provide additional insight into the characteristics of the supercell storms through the unique capabilities and vantagepoint of the TRMM science instruments.

Derived from text

Tornadoes; Trmm Satellite; Tropical Meteorology; Meteorological Parameters

20010021217 NASA Marshall Space Flight Center, Huntsville, AL USA

TRMM/LIS Lightning: Going Beyond Climatological Composites

Boccippio, Dennis J., NASA Marshall Space Flight Center, USA; Heckman, Stan, NASA Marshall Space Flight Center, USA; Renno, Nilton O., NASA Marshall Space Flight Center, USA; Christopher, P., NASA Marshall Space Flight Center, USA; Milly, D., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The high sensitivity, accuracy and pointing stability of the TRMM/LIS allows analysis of not only tropical bulk lightning production, but of storm cell-based statistics. Issues associated with per-storm flash rate identification are presented, including

minimum detectable flash rate, 'unbiasing' the low end of observed storm flash rate spectra, and cell identification. Global lightning bulk composites are disaggregated into contributions from storm frequency of occurrence and per-storm flash rate, with the former dominating the global spatial distribution. Local examination of these fields reveals offsets between peaks in flashing storm occurrence and peaks in storm flash rate, often related to geographic effects and diurnal storm evolution. The correlation of storm-level statistics with theoretical measures of meso/large scale coupling (e.g., the gross moist stability of the tropical atmosphere as calculated by Neelin et al) is shown.
Author
Trmm Satellite; Accuracy; Climatology; Lightning

20010021266 NASA Marshall Space Flight Center, Huntsville, AL USA
The Global Precipitation Mission: Understanding Rainfall Across the Scale Spectrum
Smith, Eric A., NASA Marshall Space Flight Center, USA; [2000]; 2p; In English, 2 Oct. 2000, Pasadena, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The outstanding success of the Tropical Rainfall Measuring Mission (TRMM) stemmed from a near flawless launch and deployment, a high successful measurement campaign, achievement of all original scientific objectives before the mission life had ended, and the accomplishment a number of unanticipated but important additional scientific advances This success and the realization that satellite rainfall datasets are now foremost tool in the understanding of decadal climate variability has helped motivate a comprehensive global rainfall measuring mission called "The Global Precipitation Mission" (GPM). The intent of this mission is to address looming scientific questions arising in the contex global climate-water cycle interactions, hydrometeorology, weather prediction, the global carbon budget, and atmosphere-biosphere-cryosphere chemistry. This paper addresses the status and prospects that mission currently planned for launch in the early 2007 time frame.
Author
Precipitation (Meteorology); Rain; Trmm Satellite; Microwave Imagery

20010021334 Virginia Univ., Dept. of Environmental Sciences, Charlottesville, VA USA
[Research Programs Conducted by the University of Virginia], Part 1, Aquarius *Final Report*
Fuentes, Jose, Virginia Univ., USA; Garstang, Michael, Virginia Univ., USA; Macko, Stephen, Virginia Univ., USA; Swap, Robert; February 2001; 95p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-4779; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The hydrological cycle and the source of water vapor within the Amazon River Basin have important implications on questions of global thermal transport and regional ecological and socioeconomic sustainability. A three tiered approach taking advantage of satellite imagery, tipping buckets, and isotopic storm sampling at three basin sites was used to examine different aspects of regional meteoric water. by combining these techniques, it was possible to correlate observed storm structure with rain rates and intrastorm variations.
Derived from text
Amazon Region (South America); Hydrological Cycle; Rain; River Basins; Water Vapor; Storms (Meteorology)

20010021547 Kentucky Univ., Kentucky Transportation Center, Lexington, KY USA
Evaluation of Road Weather Information System *Final Report*
Weber, J. M.; Graves, R. C.; Pigman, J. G.; May 1999; 36p; In English
Report No.(s): PB2001-102583; KTC-99-21; Copyright; Avail: National Technical Information Service (NTIS)

The objectives of this study were to monitor and evaluate the Kentucky Transportation Cabinet's Road Weather Information System (RWIS). Six systems were installed and all became operational in November 1997. Each site includes sensor which measure temperature, precipitation, relative humidity, wind speed, pavement temperature, surface condition, and chemical concentration. The data can be accessed remotely using a Windows-based software program. The data are also stored in a central database for future use. The accuracy of the system was evaluated through comparison of atmospheric data with airport data and through site observations of surface condition, pavement temperature, and air temperature. The reliability was evaluated by reviewing the history log files to located gaps in the data. Problems with individual sensors were also documented. The accuracy of the system was found to be good for the sensors that could be directly evaluated. The reliability was satisfactory with the larger gaps in data being caused by delays in detecting minor problems. Maintenance of the system was a problem during the evaluation period. Additional installations of RWIS are not recommended until a more formalized process is developed by the Kentucky Transportation Cabinet for use of the data in management of winter weather events.
NTIS
Information Systems; Roads; Weather; Evaluation; Transportation

20010021601 NASA Marshall Space Flight Center, Huntsville, AL USA

LIS Validation at The KSC-ER

Koshak, William J., NASA Marshall Space Flight Center, USA; Krider, E. P., Arizona Univ., USA; [2000]; 1p; In English; 2000 Fall Meeting, 15-19 Dec. 2000, San Francisco, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Each year, thousands of lightning electric field disturbances are recorded and archived by the ground-based field mill (FM) network at the NASA Kennedy Space Center (KSC) and USAF Eastern Range (ER). The FM network has a range of several tens of kilometers, and a digital accuracy of 4 V/m. It has provided years of continuous lightning warning surveillance to KSC-ER space vehicle launch operations, and has undergone one major hardware upgrade since its inception in the early 1970s. Additional KSC lightning warning data is derived from a multistation radio time-of-arrival system called Lightning Detection and Ranging (LDAR). This system provides the location and space-time mapping of individual lightning channels (for both cloud and ground flashes). Additional lightning information for the KSC region is available from the National Lightning Detection Network (NLDN) and a 5-station local magnetic direction finder network. In this study, all of the above mentioned data are used to ground-validate data derived from the Lightning Imaging Sensor (LIS) onboard the Tropical Rainfall Measuring Mission (TRMM). The FM network can be used to retrieve the charges deposited in a lightning flash, provided the flash is within a few kilometers of the FM Network. Although it is rare to obtain a TRMM overpass of thunderstorms hat occur this close to the FM network, seven such storms have been found and examined in this study. We compare the times and locations of LIS optical pulses with the spatial-temporal character of the FM, LDAR, and magnetic direction finder data. We also inter-compare LIS optical pulse amplitude data with FM-derived charge magnitudes, number of LDAR radio sources, and peak current values from magnetic direction finder data. Generally speaking, LIS lightning locations and times agree favorably with the KSC ground-based systems for most cases, but little correlation appears to exist between optical pulse amplitude and any of charge, # LDAR sources, peak current), owing possibly to the effects of source complexity and/or cloud multiple scattering.

Author

Imaging Techniques; Lightning; Electric Fields; Detection; Sensors

48
OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

20010019926 Army Engineer Research and Development Center, Coastal and Hydraulics Lab., Vicksburg, MS USA

Wave Climate and Littoral Sediment Transport Potential, Long Beach Island, New Jersey

Cialone, Mary A., Army Engineer Research and Development Center, USA; Thompson, Edward F., Army Engineer Research and Development Center, USA; September 2000; 75p; In English

Report No.(s): AD-A385444; ERDC/CHL-TR-00-21; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

As part of a beach nourishment feasibility study for Long Beach Island, NJ, a study of the impacts of borrowing material from nearshore and offshore regions on the regional coastal processes was required. Four potential borrow sites for the Long Beach Island nourishment project were identified: Area A-the ebb shoal at Barnegat Inlet; Area B-nearshore shoal off of Loveladies; Area D-offshore borrow area; and Area E-nearshore shoal off of Brant Beach/Beach Haven Crest. Note that these borrow sites are in three different coastal environments. Specific analyses to determine the impacts of borrowing material from these sites are: to examine the relative changes in wave climate due to bathymetric changes created at the borrow sites; to determine the changes in potential longshore transport rates; to examine the impacts on nourishment requirements for proposed beachfill areas; and to look at the relative impacts on shoreline change rates. Therefore, the objective of this study was to perform these analyses and determine the relative impacts of the four borrow sites on these processes.

DTIC

Littoral Transport; Sediment Transport; Coastal Currents; Ocean Currents

20010020432 Massachusetts Inst. of Tech., Cambridge, MA USA

Magmatism and Dynamics of Continental Breakup in the Presence of a Mantle Plume

Korenaga, Jun; February 2000; 276p; In English

Contract(s)/Grant(s): NSF OCE-94-16631

Report No.(s): AD-A384767; MIT/WHOI-00-13; Copyright; Avail: Defense Technical Information Center (DTIC)

This thesis studies the dynamics of mantle melting during continental breakups by geophysical, geochemical, and numerical analyses. The first part focuses on the mantle melting and crustal accretion processes during the formation of the Southeast Green-

land margin, on the basis of deep-crustal seismic dta. A new seismic tomographic method is developed to jointly invert refraction and reflection travel times for a compressional velocity structure, and a long-wavelength structure with strong lateral heterogeneity is successfully recovered, including 30 to 15 km thick igneous crust within a 15 km wide continent-ocean transition zone. A nonlinear Monte Carlo analysis is also conducted to establish the absolute uncertainty of model parameters. The derived crustal structure is first used to resolve the origin of a margin gravity high, with new inversion schemes using both seismic and gravity constraints. Density anomalies producing the gravity high seem to be confined within the upper crust not in the lower crust as suggested for other volcanic margins. A new robust framework is then developed for the petrological interpretation of the velocity structure of igneous crust, and the thick igneous crust formed at the continent-ocean transition zone is suggested to have resulted from vigorous active upwelling of mantle with only somewhat elevated potential temperature. In the second part, the nature of mantle melting during the formation of the North Atlantic igneous province is studied on the basis of the major element chemistry of erupted lavas. A new fractionation correction scheme based on the Ni concentrations of mantle olivine is used to estimate primary melt compositions, which suggest that this province is characterized by a large degree of major element source heterogeneity. In the third part, the nature of preexisting sublithospheric convection is investigated by a series of finite element analyses, because the strength of such convection is important to define the 'normal' state of mantle, the understanding of which is essential to identify any anomalous behavior of mantle such as a mantle plume. The results suggest that small-scale convection is likely in normal asthenosphere, and that the upwelling velocity in such convection is on the order of 1-10 cm/year.
Author
Convection; Crusts; Geophysics; Melting; Tomography

20010020452 Naval Postgraduate School, Monterey, CA USA
Evolution of Bedforms on the Inner-Shelf
Dixon, Damon Beecher, Naval Postgraduate School, USA; September 2000; 61p; In English
Report No.(s): AD-A383882; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Observations of the temporal evolution of the wave-formed ripples are analyzed in terms of geometric properties. Three weeks of bedform observations were obtained using underwater video of a sheet of laser light projected on the bed at the Monterey Bay Inner Shelf Observatory in thirteen-meter depth water. The bed consists of fine sand (mean grain size 0.12 mm). Low to moderate narrow-band swell waves occurred during the observation period. Ripple geometry consisted of orbital and suborbital vortex wave ripples, and relic ripples left after larger wave events. The bedforms generally changed size and shape when the grain roughness Shields parameter exceeded a critical value of 0.04. Ripple migration was offshore at rates of 2-10 cm/day during active sediment transport events. Skewness of velocities (low and high passed) were calculated to explain offshore ripple migration, but showed no preferred direction. Mean currents were weak. Significant positive (offshore) correlation was obtained between the short-wave envelope and infragravity waves indicating wave-group forced bound long waves (surf beat) combined with stirring by the short waves might explain the offshore sediment transport and ripple migration.
Author
Ripples; Sediment Transport; Ocean Surface; Water Waves; Sands

20010020842 Massachusetts Inst. of Tech., Cambridge, MA USA
Spectral Description of Low Frequency Oceanic Variability
Zang, Xiao-Yun; June 2000; 191p; In English
Contract(s)/Grant(s): JPL-958125; UTA-98-0222; NSF OCE-95-29545
Report No.(s): AD-A384828; MIT/WHOI-00-15; Copyright Waived; Avail: Defense Technical Information Center (DTIC)

A simple dynamic model is used with various observations to provide an approximate spectral description of low frequency oceanic variability. Such a spectrum has wide application in oceanography, including the optimal design of observations strategy for the deployment of floats, the study of Lagrangian statistics and the estimate of uncertainty for heat content and mass flux. Analytic formulas for the frequency and wavenumber spectra of any physical variable, and for the cross spectra between any two different variables for each vertical mode for the simple dynamic model are derived. No heat transport exists in the model. No momentum flux exists either if the energy distribution is isotropic. It is found that all model spectra are related to each other through the frequency and wavenumber spectrum of the stream-function for each mode, Phi(k,l,omega,n,phi,lambda), where (k,l) represent horizontal wavenumbers, omega stands for frequency, n is vertical mode number, and (phi,lambda) are latitude and longitude, respectively. Given Phi(k,l,omega,n,phi,lambda), any model spectrum can be estimated. In this study, an inverse problem is faced: Phi(k,l,omega,n,phi,lambda) is unknown; however, some observational spectra are available. I want to estimate Phi(k,l,omega,n,phi,lambda) if it exists.
Author
Dynamic Models; Spectra; Variability

20010020843 Massachusetts Inst. of Tech., Cambridge, MA USA

Large Scale Oceanic Circulation and Fluxes of Freshwater, Heat, Nutrients and Oxygen

Ganachaud, Alexandre Similien; December 1999; 270p; In English

Contract(s)/Grant(s): JPL-958125

Report No.(s): AD-A384765; MIT/WHOI-00-10; Copyright Waived; Avail: Defense Technical Information Center (DTIC)

A new global inversion is used to estimate the large scale oceanic circulation based on the World Ocean Circulation Experiment and Java Australia Dynamic Experiment hydrographic data. A linear inverse 'box' model is used to combine consistently the transoceanic sections. The circulation is geostrophic with an Ekman layer at the surface and oceanic layers defined by neutral surfaces. Near-conservation of mass, salt, and top-to-bottom silica is required and, in addition, heat and the phosphate-oxygen combination are conserved in layers that are not in contact with the surface. A globally-consistent solution is obtained for a depth-independent adjustment to the thermal wind field, freshwater flux divergences, the Ekman transport, and the advective and diffusive dianeutral fluxes between layers. A detailed error budget permits calculation of statistical uncertainties, taking into account both the non-resolved part of the solution and the systematic errors due to the temporal oceanic variability. The estimated water mass transports during the WOCE period are generally similar to previous published estimates. However, important differences are found. In particular, the inflow of bottom waters into the Pacific Ocean is smaller than in most previous estimates. Utilization of property anomaly conservation constraints allows the estimate of significant dianeutral diffusivities in deep layers, with a global average of 3 +/- 1 sq cm/s north of 30 deg S. Dianeutral transfers indicate atmosphere heat fluxes are found, with a global heating of 2.3 +/- 0.4 PW in the tropical band and corresponding cooling at high latitudes. The signature of a large-scale average export production is found for nutrients in several temperate regions. Despite the large uncertainties, the production magnitudes are consistent with independent measurements from sediment traps and isotopic data. Net nutrient sources or sinks are found in several regions, suggesting either transport of dissolved organic matter or a seasonal alias. Oxygen indicates large exchanges with the atmosphere, with intake at high latitudes and outgassing/remineralization at low latitudes.

Author

Ocean Currents; Water Circulation; Hydrography; Water

20010020936 Bureau of Reclamation, Great Plains Region, Billings, MT USA

Rincon Bayou Demonstration Project. Concluding Report, Volume 2, Findings

Dunton, Kenneth H., Texas Univ., USA; Ward, G. H., Texas Univ., USA; Montagna, Paul A., Texas Univ., USA; Whitledge, Terry E., Alaska Univ., USA; Alexander-Mahala, Heather D., Texas Univ., USA; Sep. 2000; 306p; In English

Report No.(s): PB2001-102253; Copyright; Avail: National Technical Information Service (NTIS)

The Rincon Bayou Demonstration Project significantly lowered the minimum flooding threshold of the upper Nueces Delta, thereby increasing the opportunity for larger, more frequent diversions of fresh water from the Nueces River. During the 50-month demonstration period, the amount of fresh water diverted into the upper Nueces Delta was increased by about 732%. Five freshwater inflow events were sufficient to activate the project's Rincon Overflow Channel and inundate, to varying degrees, the tidal flats of the upper delta. These tidal flats would not have otherwise been directly freshened. As a result, in a relatively short period of time (only 4.2 years after the opening of the project's Nueces Overflow Channel), the average salinity gradient in the upper delta reverted to a more natural form, with average salinity concentrations in upper Rincon Bayou becoming the lowest in Nueces Delta. The effects of the demonstration project on the ecology of Rincon Bayou and the upper Nueces Delta were positive to the environment. Single-celled plant communities in the water column (phytoplankton) and on the surface of the sediments (microphytobenthos) evidenced increases in primary productivity with the reduction of salinity concentrations. Benthic communities (composed of bottom-dwelling organisms) evidenced increases in abundance, biomass and diversity. And, vegetation communities evidenced increases in plant cover and decreases in bare area. In summary, it was observed that freshwater inflow controlled, to a great extent, the ecological function of the upper delta ecosystem by regulating critical biological mechanisms.

NTIS

Hydrology; Water Resources; Ecosystems; Flood Control

20010020937 Bureau of Reclamation, Great Plains Region, Billings, MT USA

Rincon Bayou Demonstration Project. Concluding Report, Volume 1, Executive Summary

Dunton, Kenneth H., Texas Univ., USA; Ward, George H., Texas Univ., USA; Montagna, Paul A., Texas Univ., USA; Whitledge, Terry E., Alaska Univ., USA; Alexander-Mahala, Heather D., Alaska Univ., USA; Sep. 2000; 36p; In English

Report No.(s): PB2001-102252; Copyright; Avail: National Technical Information Service (NTIS)

The Rincon Bayou Demonstration Project significantly lowered the minimum flooding threshold of the upper Nueces Delta, thereby increasing the opportunity for larger, more frequent diversions of fresh water from the Nueces River. During the 50-month demonstration period, the amount of fresh water diverted into the upper Nueces Delta was increased by about 732%. Five freshwa-

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NTIS
Hydrology; Water Resources; Hydrography; Water Flow; Ecology

20010021298 Washington Univ., Applied Physics Lab., Seattle, WA USA
Bubble Clouds and their Transport within the Surf Zone as Measured with a Distributed Array of Upward-Looking Sonars ***Final Report, 1 Feb. 1999 - 31 Mar. 2000***
Dahl, Peter H., Washington Univ., USA; Sep. 20, 2000; 20p; In English
Contract(s)/Grant(s): N00014-91-C-0072; N00014-96-1-0325
Report No.(s): AD-A384011; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

A collaborative, multi-institute experiment called the Scripps Pier Experiment was conducted in the vicinity of the Scripps pier in La Jolla, CA, in March 1997 to study the fate of bubbles in the surf zone and the effects of these bubbles on acoustic propagation. This paper discussed data gathered by the Applied Physics Laboratory, University of Washington, using a set of four upward-looking sonars (frequency 240 kHz), which simultaneously measured vertical profiles of acoustic volume scattering from bubbles at four locations. The transport of bubbles via rip currents emerged as an important feature of the acoustic environment. Images of volumetric backscattering strength vs time and depth reveal episodic events lasting between 5 and 10 minutes. The influence of the incoming wave field is also discussed.
DTIC
Bubbles; Clouds (Meteorology); Acoustic Scattering; Acoustic Propagation

20010021388 Woods Hole Oceanographic Inst., Applied Ocean Physics and Engineering Dept., MA USA
Diapycnal Diffusivity Inferred from Scalar Microstructure Measurements Near the New England Shelf/Slope Front
Rehmann, Chris R., Illinois Univ. at Urbana-Champaign, USA; Duda, Timothy F., Woods Hole Oceanographic Inst., USA; Journal of Physical Oceanography; 2000; Volume 30, pp. 1354-1371; In English
Contract(s)/Grant(s): N00014-95-1-1064
Report No.(s): AD-A384072; WHOI-CONTRIB-9869; Copyright; Avail: Defense Technical Information Center (DTIC)

Conductivity microstructure was used to estimate the diapycnal thermal eddy diffusivity K(sub r) near the New England shelf/slope from in early August 1997. Two datasets were collected with a towed vehicle. One involved several horizontal tows in and above a warm, salty layer near the seafloor, and the other was from a tow-yo transect that sampled most of the water column. In the bottom layer, K(sub r) derived from microstructure is a factor of about 5 smaller than estimated derived from tracer dispersion at the same density level, and the diffusivity decreases sharply as the buoyancy frequency N increase: K(sub r) is proportional to N(sup -3,1). With several assumptions, this behavior is consistent with laboratory results for shear-driven entrainment across a density interface. The bottom layer cools as it moves up the shelf mainly due to diapycnal mixing, and a simplified temperature budget of the layer yields a diffusivity of 3 x 10(exp -6) sq m/s, which is between the values derived from microstructure and tracer dispersion. In the tow-yo transect, K(sub r), and the thermal variance dissipation rate chi(sub r) were high in in a frontal region where intrusions were observed at several depths. Averaged over the entire transect, however, K(sub r) was slightly lower in water favorable for diffusive layering than it was in either water favorable for salt fingers or diffusively stable water. The eddy diffusivity estimated throughout the water column behaved as K(sub r) proportional to N(sup 1.3+/-0.8), decreasing less sharply for increasing stratification than near the bottom.
DTIC
Thermal Conductivity; Microstructure; Thermal Diffusivity

20010021390 Woods Hole Oceanographic Inst., Physical Oceanography Dept., MA USA

Near-Boundary Mixing Above the Flanks of a Midlatitude Seamount

Toole, John M., Woods Hole Oceanographic Inst., USA; Schmitt, Raymond W., Woods Hole Oceanographic Inst., USA; Polzin, Kurt L., Woods Hole Oceanographic Inst., USA; Kunze, Eric, Washington Univ., USA; Journal of Geophysical Research; Oct. 22, 2000; Volume 102, No. C1, pp. 947-959; In English

Contract(s)/Grant(s): N00014-89-J-1973

Report No.(s): AD-A384126; WHOI-CONTRIB-9068; Copyright; Avail: Defense Technical Information Center (DTIC)

Fine-scale velocity and density profile data with concurrent turbulent velocity and temperature dissipation estimates obtained above the flanks of Fieberling Guyot, a seamount in the eastern North Pacific Ocean, are examined for evidence of near-bottom boundary mixing. Fine-scale shear and strain spectral levels were elevated over the flanks of the seamount in a 500-m-thick stratified layer above the bottom. The velocity shear was horizontally isotropic, and no significant correlation between shear and strain was observed. Above the steepest bottom slopes near the seamount summit rim, excess vertical strain relative to shear was observed (as compared to the background internal wave field), suggesting the presence of high-frequency internal waves. These signals may have been the product of wave reflections from the steep flanks of the seamount and/or wave generation from tidal currents flowing over the rough bottom. Associated with the enhanced shears and strains were more frequent occurrences of low 10-m Richardson number events, increased overturning scales, and larger estimated turbulent eddy diffusivity relative to observations 15 km or more from the seamount. In particular, turbulent diffusivity estimates increased from O(0.1 x 10(exp -4) sq m/s) in the ocean interior to 1 - 5 x 10(exp -4) sq m/s within 500 m vertically (1-3 km horizontally) of the seamount flank. A simple geometric scaling argument suggests that boundary mixing of this intensity has relevance to the large-scale circulation at abyssal depths where a large fraction of the ocean waters is in close proximity to the bottom.

DTIC

Velocity Distribution; Density Distribution; Temperature; Dissipation; Estimates; Seamounts

51
LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20010019903 Michigan Univ., Ann Arbor, MI USA

Breast Cancer Vaccines Based on Dendritic Cells and the Chemokines ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***

Mule, James, Michigan Univ., USA; July 2000; 168p; In English

Contract(s)/Grant(s): DAMD17-96-1-6103

Report No.(s): AD-A385673; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy

The major objective of this project is to establish a new modality for the treatment of breast cancer that employs the combination of chemokines with breast tumor-pulsed dendritic cells to both recruit and/or concentrate from the periphery low frequency immune reactive T cells as well as to potently stimulate these effector cells once localized at the vaccination site. During the fourth year of this project, studies were focused on four major areas specified either in the Statement of Work or in response to issues raised in the original Peer Review Panel Report: (1) to complete in vitro optimization of human DC generation and function; (2) to identify the most promising chemokine to focus our efforts; (3) to identify the most efficient delivery of a chemokine gene; and (4) to test the vaccine strategy in a relevant breast tumor model in mice. These areas have all been successful and have resulted in eight additional publications (totaling 17 publications to date for the project), the awarding of a new spin-off NCI/NIH R01 grant, and the initiation of a phase II clinical trial in advanced breast cancer patients. During the course of our studies related to the Technical Objectives, we made the important discovery that SLC can significantly inhibit the growth of breast tumor in mice. We successfully constructed a recombinant adenovirus vector containing the SLC gene, which can transduce dendritic cells at high efficiency for use in our cancer vaccine strategy. The data and the appended publications provided in this fourth annual report show our overall accomplishments and productivity in this DoD funded research project.

DTIC

Mammary Glands; Cancer; Vaccines; Growth; Clinical Medicine

20010019983 California Univ., San Francisco, CA USA

Improving the Specificity of High Resolution Breast MRI by Optimizing Data Acquisition Techniques and Diagnostic ***Annual Report, 1 Sep. 1998-31 Aug. 1999***

Partridge, Savannah; Sep. 1999; 18p; In English

Contract(s)/Grant(s): DAMD17-98-1-8191

Report No.(s): AD-A385518; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Magnetic resonance imaging (MRI) techniques have the potential to greatly improve breast cancer detection, diagnosis, and treatment. Contrast-enhanced breast MRI has shown greater sensitivity than mammography in the detection of small breast lesions, and can also successfully image dense, augmented, and postoperative breasts. MRI is becoming a valuable tool in surgical planning and is additionally being investigated for monitoring tumor response to therapy. The purpose of this study is to develop and optimize new diagnostic models for improved discrimination of benign and malignant breast tissue. It is hypothesized that the addition of dynamic enhancement data from muscle and vessels to models which currently utilize only lesion enhancement information will improve tumor differentiation and will minimize patient to patient variations to improve the overall specificity of MRI in the detection of breast cancer. Breast MRI data acquisition techniques will be modified and patient data analyzed to provide optimal dynamic behavior information of the tissues. The performance of the resulting models will be evaluated and the increase in MRI specificity due to the application of optimized models will be quantified. The outcome of this work will contribute to the development of an accurate method of assessing tumor treatment response using MRI.

DTIC

Cancer; Diagnosis; Imaging Techniques; Magnetic Resonance; Mammary Glands

20010019984 Baylor Coll. of Medicine, Houston, TX USA

C-Jun N-terminal Kinase and Apoptotic Signaling in Prostate Cancer ***Annual Report, 1 Jul. 1999-30 Jun. 2000***

Chen, Yi-Rong; Jul. 2000; 44p; In English

Contract(s)/Grant(s): DAMD17-99-1-9507

Report No.(s): AD-A385606; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Understanding the biochemical mechanisms of apoptosis is important for revealing cancer biology and for improving cancer therapies. The c-Jun N-terminal kinase (JNK) pathway participates in cellular responses to both environmental stresses and mitogenic signals. JNK is involved in cellular signaling during apoptosis induced by various agents including Gamma-radiation, UV-radiation, anti-carcinogenic isothiocyanates, and retinoid analog N-(4-hydroxyphenyl) retinamide (4-HPR) in various cancer cells. Interfering with the JNK pathway suppressed the induction of apoptosis. JNK activation by apoptotic stimuli can be caspase-dependent or independent. Different apoptotic stimuli induce JNK activation through distinct mechanisms. The involvement of JNK in both mitogenic and apoptotic signaling implies that a subtle regulatory mechanism must exist for the signaling decision. Our studies reveal that the duration of JNK induction may determine cell fate. In conclusion, our study reveals the importance of the JNK pathway in apoptotic signaling. These results provide important information for the studies of oncogenesis and the mechanisms of radiation and drug resistance in cancer cells.

DTIC

Apoptosis; Cancer; Prostate Gland; Cells (Biology); Signal Detection

20010019985 Baylor Coll. of Medicine, Houston, TX USA

The Molecular Basis of the Response to Radiation ***Annual Report, 26 May 1998-25 May 1999***

Plon, Sharon E.; Jun. 1999; 10p; In English

Contract(s)/Grant(s): DAMD17-98-1-8281

Report No.(s): AD-A385617; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This is the first year of this three year IDEA Award. The most challenging aspect of this project is the isolation of novel cDNAs encoding human homologs of yeast DNA damage response genes. to date complementation of the yeast mutant rad9 have not yielded human cDNAs with significant homology. Thus, over the last year we have made a major effort to isolate cDNAs by degenerate PCR strategies which is still underway. In addition, the use of specific two hybrid screens using known human DNA damage response/cell cycle genes has resulted in the isolation of human homologs ofRADJ8 and RAD2l. The subsequent objectives are focused on determination of whether cDNAs isolated in genetic screens are altered in expression or structure in breast cancers. The reagents including RNA, DNA and protein from human breast cancer cell lines grown under identical culture conditions were produced during the first year of the companion CDA award. This set of reagents has been used and demonstrated increased expression of the RAD2l RNA in some breast cancer cell lines. This prompted the development of a Rad2l antibody which has

been completed and will be used for analysis of protein expression in these lines and murine models of mammary tumorigenesis in subsequent years of the grant.
DTIC
Mammary Glands; Cancer; Radiation Effects; Molecular Biology; Responses

20010020011 Washington Univ., Saint Louis, MO USA
Role of Nkx3.1 Homeodomain Protein in Prostate Carcinogenesis and Differentiation ***Annual Report, 15 Jan. 1999-14 Jan. 2000***
Milbrandt, Jeffrey D.; Feb. 2000; 7p; In English
Contract(s)/Grant(s): DAMD17-99-1-9026
Report No.(s): AD-A385631; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Prostate cancer is a significant health problem in aging American men. Approximately 350,000 American men were diagnosed and 42,000 deaths were attributed to prostate cancer in 1998. Despite identification of chromosomal regions of instability that are associated with prostate cancer, there are an undetermined series of molecular events that lead to de-differentiation of prostatic epithelial cells and ultimately to prostate carcinoma. The specific genes responsible for neoplastic transformation of the prostate are largely unknown. Nkx3.1 is a homeodomain transcription factor that is expressed in an androgen-dependent and largely prostate specific manner. The Nkx3.1 gene localizes to the chromosomal region 8p21, a region that is often deleted in human prostate cancers. The goals of this study are to overexpress Nkx3.1 in vitro and determine the effects on growth/differentiation, patterns of target gene expression and tumorigenicity of prostate carcinoma cell lines. Expression patterns of Nkx3.1 in human prostate tumor specimens will be examined immunohistochemically, and microdissected prostate tumor samples will be used to search for Nkx3.1 mutations and/or evidence of hypermethylation. Specific cell types and androgen-dependent expression patterns of Nkx3.1 will also be monitored immunohistochemically in mouse prostates. Overall, our work will determine whether loss of Nkx3.1 function is a major cause of prostate cancer.
DTIC
Prostate Gland; Cancer; Carcinogens; Gene Expression; Genes; Chromosomes

20010020012 Cincinnati Univ., OH USA
Investigation of the Candidate Tumor Supressor Gene prk in Prostate ***Annual Report, 15 Feb. 1999-14 Feb. 2000***
Dai, Wei; Mar. 2000; 22p; In English
Contract(s)/Grant(s): DAMD17-99-1-9027
Report No.(s): AD-A385634; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The development of prostate cancer is thought to be driven, at least in part, by the inactivation of as yet unknown tumor suppressor genes, which are manifested as sites of nonrandom allele loss. Thus, the identification and characterization of these genes is of utmost importance to the understanding of this clinical important malignancy. Our early studies have led to the identification and characterization of Prk, a gene coding for a cell cycle serine/threonine kinase. We have mapped the Prk gene to chromosome 8p21, a site frequently lost in prostate cancer and proposed to harbor tumor suppressors. We have shown that the Prk gene is partially deleted in LACP9AD (pro static carcinoma), Weri-RB1 (retinoblastoma) and Dami (leukemia) cell lines. Prk gene expression, as detected by Northern blotting, is down-regulated in a majority of head and neck cancer. In addition, Prk protein interacts and phosphorylates CDC25C, a dual specific phosphatase critical for the onset of mitosis. Our studies strongly suggest that a functional loss of Prk, a cell cycle regulator, may contribute to the development of various malignancies including prostate cancer.
DTIC
Prostate Gland; Cancer; Gene Expression; Genes; Clinical Medicine

20010020014 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA
Osteoblast-Prostate Cancer Cell Interaction in Prostate Cancer Bone ***Annual Report, 4 Jan. 1999 - 3 Jan. 2000***
Navone, Nora M.; Feb. 2000; 12p; In English
Contract(s)/Grant(s): DAMD17-99-1-9028
Report No.(s): AD-A385637; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Prostate cancer cells have a remarkable affinity to develop metastases in bone. Clinical data and laboratory observations both suggest that bone-malignant epithelium interactions play a central role in prostate cancer progression. We have developed an in vitro model system that reflects the most common cellular features of prostate cancer bone metastases. The model consists of the prostate cancer cell lines: MDA PCa 2a or MDA PCa 2b (the TabBO cells) co-cultured with primary mouse osteoblasts (PMO). The two cell types share medium but are not in physical contact because the prostate cancer cells are plated in cell-culture inserts. We have established the optimal conditions for growing prostate cancer cells in co-culture with PMO. Using those conditions,

we defined the effect that prostate cancer cells have in PMO in our model system. This effect reflects the interaction between prostate cancer cells and osteoblasts in prostate cancer bone metastases. Therefore we conclude that our model system may be suitable to study the molecular and cellular events involved in the new bone formation observed in prostate cancer bone metastases.
DTIC
Prostate Gland; Cancer; Clinical Medicine

20010020015 Minnesota Univ., Minneapolis, MN USA
Chemokine Receptors and Integrin Function in Prostate Cancer ***Annual Report, 15 Jan. 1999-14 Jan. 2000***
McCarthy, James B.; Feb. 2000; 19p; In English
Contract(s)/Grant(s): DAMD17-99-1-9029
Report No.(s): AD-A385639; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Preliminary data demonstrated that the addition of specific alpha-chemokines, IL-8 and Gro-alpha, to prostate carcinoma cell cultures, leads to an increase in the motility and invasion of these cells in vitro. Based on these results, as well as others, we hypothesize that: (a) addition of alpha-chemokines to prostate carcinoma cells stimulates intracellular signaling pathways that lead to enhanced integrin mediated adhesion to ECM components; (b) stimulation of chemokine receptors results in the activation of specific rho family of GTPases causing changes in integrin function, and (c) inhibition of chemokine-induced activation of specific rho family GTPases will inhibit chemokine induced enhancement of integrin function and tumor cell motility and invasion. These hypotheses will be addressed in two specific aims. In the first specific aim, prostate carcinoma cell lines will be evaluated for the ability to respond to chemokines by measuring adhesion, motility and invasion; response to chemokines will be correlated to expression of specific chemokine receptors by tumor cells. The effect of chemokines on ligand binding by prostate cancer cell integrins will also be measured to determine if chemokines stimulate integrin avidity or affinity. Secondly, gene transfer experiments will be used to determine if specific rho family dominant-negative GTPases inhibit the alpha-chemokine stimulated increase in integrin function, migration and invasion.
DTIC
Prostate Gland; Cancer

20010020035 California Univ., Los Angeles, CA USA
Isolation and Functional Characterization of Prostate Tumor-Specific Hypoxia-Inducible Promoter/Enhancer Elements for Use in Gene Therapy ***Annual Report, 1 Dec. 1998-30 Nov. 1999***
Dougherty, Shona T.; Dec. 1999; 9p; In English
Contract(s)/Grant(s): DAMD17-99-1-9003
Report No.(s): AD-A384863; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The major objective of this research project is to identify and characterize promoter/enhancer elements that can be used to specifically target the expression of therapeutic genes to hypoxic regions within prostatic tumors in vivo. We have characterized sequences present within the human TNF-alpha promoter that are responsible for both constitutive activity and induction by hypoxia. We have produced a mutated version of this promoter that exhibits substantially reduced constitutive activity in epithelial cells while retaining responsiveness to various activating stimuli including hypoxia and ionizing radiation. While lacking prostate specificity, it is hoped nevertheless that this element may prove useful in various cancer gene therapy applications. In addition, we have cloned and characterized a large panel of novel sequences that exhibit high levels of constitutive promoter activity in prostate cell lines. Finally, we have identified a number of hypoxia inducible-promoter element and are currently characterizing these with respect to their prostate specificity.
DTIC
Prostate Gland; Cancer; Radiation Therapy; Isolation; Genes; Cells (Biology)

20010020040 Maine Univ., Darling Marine Center, Walpole, ME USA
Degradation of Aliphatic and Aromatic Hydrocarbons by the Microbiota of Animal Burrow Wall Sediments ***Final Report, Feb. 1996 - Sep. 1999***
King, Gary M.; Nov. 30, 2000; 4p; In English
Contract(s)/Grant(s): N00014-96-1-592
Report No.(s): AD-A384940; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of our research was to document the extent to which burrowing macro fauna can be used to enhance biodegradation of aromatic hydrocarbon pollutants in marine sediments by stimulating aerobic microbial metabolism in burrow walls. Our specific objectives included characterizing degradation potentials for a variety of macrofauna. We also enriched and isolated relevant novel PAH-degrading bacteria and conducted manipulative experiments with them to enhance degradation in sediments. In

a parallel effort, we have explored the anaerobic degradation of polar PAH metabolites that often persist in environments with significant PAH loading.
DTIC
Polycyclic Aromatic Hydrocarbons; Aliphatic Hydrocarbons; Biodegradation; Ocean Bottom; Microorganisms; Sediments

20010020041 Food and Drug Administration, Div. of Molecular Epidemiology, Jefferson, AR USA
Novel Recruitment Techniques for a Study of Culture-Specific Diet, Metabolic Variability and Breast Cancer Risk in African-American Women ***Annual Report, 1 Jul. 1998 - 1 Jul. 1999***
Ambrosone, Christine B.; Aug. 1999; 204p; In English
Contract(s)/Grant(s): MIPR-7JBJYXM8914
Report No.(s): AD-A384941; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Little is known regarding explanations for racial disparities in breast cancer incidence among younger women and tumor agressiveness, perhaps because of the difficulty in enrolling African-Americans into research studies. The purpose of this pilot study was to develop a novel method of recruitment, focused primarily on minority women, and investigate previously unexplored risk factors in breast cancer epidemiology. Eligible cases and controls are contacted by women who are breast cancer survivors and asked to participate in the study. To date, interviews have been completed for 181 women, aged 29-75, with breast cancer and 48 community controls. The participation rate (the proportion of women who complete the study) for cases is 73% for Caucasian women, and 60% for African-American women. The infrastructure for case-control epidemiologic studies has been built, and a specimen bank was established to enable exploration of future hypotheses.
DTIC
Cancer; Mammary Glands; Race Factors; Culture (Social Sciences); Diets

20010020048 Texas Univ. at Dallas, Richardson, TX USA
Molecular Analysis of Neurotoxin - Induced Apoptosis ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
D'Mello, Santosh R.; Sep. 2000; 47p; In English
Contract(s)/Grant(s): DAMD17-99-1-9566
Report No.(s): AD-A384860; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Apoptosis, a cell-suicide process required for normal brain development, can also be aberrantly triggered in certain neurodegenerative diseases and following exposure to neurotoxins. We hypothesize that certain components of the signaling pathways activated by these different physiological and pathophysiological stimuli might be shared and could serve as targets for the development of therapeutic approaches. In our application, we proposed to compare the signaling pathways activated by four different apoptotic stimuli using cultures of rat cerebellar granule neurons with the goal of identifying common signaling molecules. During the first three years, our goal was to use one of these apoptotic stimuli - potassium (K+) deprivation - and examine the role of four different apoptosis-regulatory molecules. Results obtained over the past year have strengthened our contention that NF-kB is a molecule central to neuronal survival. Other results have shown that the second molecule under study, p38 MAP kinase, affects neuronal survival in a complex manner. Whereas p38-alpha might promote neuronal death, its activity might be neutralized by p38-beta which promotes survival. Apoptosis by K+ deprivation may be due to the decreased p38-beta activity. Finally, our experiments with caspases indicate that these molecules may not be central to the regulation of neuronal apoptosis.
DTIC
Apoptosis; Cells (Biology); Toxins and Antitoxins; Diseases; Molecules; Neurophysiology; Nervous System

20010020128 California Univ., Berkeley, CA USA
Expression Profiling of Tyrosine Kinase Genes ***Annual Report, 1 Aug. 1999-31 Jul. 2000***
Weier, Heinz U.; Aug. 2000; 67p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9250
Report No.(s): AD-A385743; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

There is strong evidence that the expression of genes involved in signal transduction such as protein kinases is altered in tumor cells and that the aberrant expression of one or several of these genes parallels the progression of tumors to a more malignant phenotype. We developed a DNA micro-array based screening system to monitor the level of expression of tyrosine kinase (tk) genes and to derive quantitative information to support prognostication and therapeutic decisions. In the first year of this effort, we finished the development and testing of hardware necessary to prepare the DNA micro-arrays, performed RNA extraction, cDNA preparation and labelling reactions, and defined a working protocol for array hybridization and quantitative analysis. Our prototype design simultaneously measures the expression of 58 different tk genes. Additional targets for investigation will be defined by the ongoing molecular cloning and sequencing of gene transcripts found in breast cancer cell lines and clinical specimens.

Using a set of phenotypically well characterized breast cancer cell lines, the system has proven to be able to deliver reproducible data regarding changes in tk gene expression during cell transformation and progression towards a more malignant phenotype.
DTIC
Tyrosine; Gene Expression; Transferring; Genes

20010020129 Clemson Univ., SC USA
Finite Element Based Photon Migration Imaging ***Annual Report, 1 May 1999-30 Apr 2000***
Jiang, Huabei, Clemson Univ., USA; May 2000; 47p; In English
Contract(s)/Grant(s): DAMD17-99-1-9130
Report No.(s): AD-A385742; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This research is aimed at developing a new optical approach, called "Photon Migration Imaging", for breast cancer detection and diagnosis. The project will develop computer software and conduct phantom experiments to achieve the proposed goals. During the first year of this project, we have developed a number of novel schemes that can enhance our current 2D reconstruction software. We have constructed and tested a multi--channel frequency-domain imaging system. We have conducted phantom experiments that confirmed our software enhancement. We have also performed successful fluorescence phantom studies that were proposed to occur during the second year of the project.
DTIC
Finite Element Method; Computer Programs; Mammary Glands; Cancer; Diagnosis; Imaging Techniques; Photons

20010020130 Evanston Northwestern Healthcare Research Inst., Evanston, IL USA
Caspase Deficiency: Involvement in Breast Carcinogenesis and Resistance ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Yang, Xiaohe, Evanston Northwestern Healthcare Research Inst., USA; Jul. 2000; 45p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9180
Report No.(s): AD-A385741; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This project was designed to study the incidence and significance of caspase deficiency in breast cancer carcinogenesis and resistance. Task 1 for the first 15 months was to detect caspase expression in breast cancer cell lines and breast cancer tissues. In the past 12 months, we have expanded and cryopreserved 20 cell lines for future study. Detection of caspase expression from breast cancer cell lines revealed that caspase levels varied significantly amongst different cell lines. For example, caspase 6, 8 and 10 levels in HS-578T cells were significantly lower than that of other cell lines. Detection of caspase 3 expression in 40 breast cancer tissues using either immunohistochemistry or Western blot indicated that approximately one fifth of breast cancer tissues had abnormally low or deficient caspase expression. These data suggests that caspase down-regulation/deficiency may have clinical significance, which is consistent with our hypothesis. Caspase detection/screening is currently being continued. Another part of our work was on the characterization of caspase 3 reconstituted MCF-7 cells in response to chemo- and radio- therapies. We found that caspase 3 reconstitution sensitizes MCF-7 cells to both chemo- and radio- therapies.
DTIC
Cancer; Mammary Glands; Enzymes; Carcinogens; Therapy

20010020131 Colorado Univ., Health Sciences Center, Denver, CO USA
Tamoxifen Resistant Breast Cancers: Inappropriate Transcriptional Coregulators ***Annual Report, 16 Aug. 1999-15 Aug. 2000***
Horwitz, Kathryn B., Colorado Univ., USA; Sep. 2000; 24p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9146
Report No.(s): AD-A385740; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

To determine whether the agonist activities of tamoxifen are exaggerated in hormone-resistant breast cancers, we proposed that coregulatory proteins influence the direction of transcription by antagonist-occupied steroid receptors. We screened for such proteins, and identified three novel cDNA fragments encoding peptides that interact with antagonist-bound PRs. The aims were to clone the complete cDNAs and define their structure (Aim 1); define the role of the unknown proteins on receptor activity (Aim 2); and, if appropriate, determine the role of these proteins in hormone dependency of breast cancers (Aim 3). We have focused on one novel cDNA fragment, designated ORF#93. In the first year we cloned the full-length cDNA; assembled its genomic structure; localized the gene to chromosome 15q26. 1; expressed the full-length protein; defined its tissue distribution; determined its subcellular localization to be cytoplasmic; and generated a polyclonal antibody that probes a 103 kDa protein. Functional studies have been started and are ongoing. The protein does not appear to have a major effect on transcription; anti sense studies have been devised to test this further. Significance. We now believe that ORF#93 has a cytoplasmic 'scaffolding' function, and allows

receptors to interact with other proteins in multiprotein complexes, perhaps in association with hsp90. If so, ORF#93 may be important for cross-talk between growth factor and nuclear receptor signaling pathways.
DTIC
Estrogens; Mammary Glands; Cancer; Proteins; Receptors (Physiology)

20010020132 Colorado Univ., Denver, CO USA
Mechanism of Growth Factor Attenuation of Cell Death in Chemotherapy Treated Breast Cancer Cells ***Annual Report, 1 Aug. 1999-31 Jul. 2000***
VanDenBerg, Carla, Colorado Univ., USA; Aug. 2000; 44p; In English
Contract(s)/Grant(s): DAMD17-99-1-9142
Report No.(s): AD-A385739; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Upregulation of IGF-I (Insulin-like Growth Factor-I) receptor dependent pathways like phosphatidylinositol 3-kinase (PI3K) may diminish chemosensitivity of breast cancer cells via c-Jun N-terminal kinase (JNK) response. In this project we set out to determine if IGF-I activates the PI3K survival pathway. We also predicted that IGF-I treatment of breast cancer cells would inhibit the stress-induced pathway JNK which is activated by some chemotherapy drugs. Initially, we performed PI3K assays and determined that IGF-I treatment of MCF-7 breast cancer cells strongly activated PI3K. Similarly, IGF-I treatment activated both downstream kinases Akt and p70S6. Next, we assessed if JNK activity was induced by stress treatment of MCF-7 cells, using doxorubicin, taxol, taxotere, and ultraviolet irradiation (UV). Taxol, taxotere and UV were the strongest activators of JNK activity and were used for subsequent IGF-I co-treatment assays. Surprisingly, IGF-I treatment alone lead to significant activation of JNK. Further, inhibition of PI3K inhibited IGF-I induction of JNK, suggesting that PI3-kinase may convey survival responses through JNK. When cells were co-treated with IGF-I and stress treatment, JNK activity was additive compared to either treatment alone. Transfection experiments support that IGF-I mediated survival responses are conveyed through PI3K and Akt.
DTIC
Cancer; Mammary Glands; Chemotherapy; Cells (Biology)

20010020134 Alabama Univ., Birmingham, AL USA
Genistein Programming Against Prostate Cancer ***Annual Report, 1 Sep. 1998-30 Aug. 1999***
Lamartiniere, Coral A.; Sep. 1999; 10p; In English
Contract(s)/Grant(s): DAMD17-98-1-8582
Report No.(s): AD-A385695; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The purpose of this research is to develop a rodent prostate cancer model and to investigate the potential of genistein to suppress the development of this cancer. We have hypothesized that exposure to genistein, a component of soy, during early critical periods of development will modulate development of hormone responsive target organs and cell differentiation. We further hypothesized that these developmental modifications set the program for later response to hormonally-active effectors. We believe that programming events play a significant role in determining susceptibility for prostate cancer. Starting at conception, rats were exposed to 0, 25 and 250 mg genistein/kg AlN-76A diet. Seven week old male offspring were injected orthotopically into the dorsolateral prostate with the carcinogen, N-methylnitrosurea (NMU), for the induction of adenocarcinomas which takes 12 months. Animals are being palpated on a weekly basis for tumors (to be continued in the second year). Also, we have measured, in 187 day old rats exposed +/- genistein and to NMU, biomarkers in the dorsolateral prostate. mRNA and protein levels of EGF-receptor and androgen receptor were not altered. Understanding the in vivo mechanism of genistein action should allow soy, genistein, or potent genistein analogues to be used against prostate cancer in humans.
DTIC
Cancer; Prostate Gland; Computer Programming; Proteins

20010020135 Washington Univ., Saint Louis, MO USA
Patient Preferences for Outcomes Associated With Surgical Management of Prostate Cancer ***Annual Report, 1 Oct. 1998-30 Sep. 1999***
Catalona, William; Oct. 1999; 13p; In English
Contract(s)/Grant(s): DAMD17-98-1-8498
Report No.(s): AD-A385694; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this project is to assess patient preferences for health states following radical prostatectomy for localized prostate cancer. Approximately 430 community volunteers enrolled in a prostate cancer screening study were diagnosed with localized prostate cancer from 1994 through 1997 and opted for radical prostatectomy. We have previously evaluated function and bother in this cohort with regard to urinary and sexual domains. Based on these data, we have stratified our cohort into three groups: (1)

men bothered by both their current urinary and sexual functioning, (2) men bothered by their current sexual functioning, but not urinary functioning, and (3) men not bothered by either. We have randomly selected approximately equal 50 men from each group (total N = 155) and have assessed preferences for current health states as utilities (i.e., the proportion of remaining life expectancy men would be willing to trade to have ideal health rather than current health). Preliminary analysis indicate lower utilities for men bothered by both current and sexual functioning. Rational decision making in the setting of prostate cancer detection and treatment requires comparing the potential benefits of screening with the potential harms. Because utilities measure the gain in length of life needed to offset undesirable health states, they provide a formal method for characterizing that tradeoff.
DTIC
Cancer; Patients; Prostate Gland; Surgery

20010020136 Dartmouth Coll., Hanover, NH USA
MR Measurement of Breast Tissue's Anisotropic Mechanical Properties ***Annual Report, 1 Jul. 1996-30 Jun. 1999***
Weaver, John B.; Jul. 1999; 71p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-96-1-6119
Report No.(s): AD-A385692; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of this grant was to develop methods to estimate the mechanical properties of tissue, especially the elasticity, in vivo. These methods will be used to evaluate mechanical properties, such as the elasticity, as indicators of breast cancer. MR images were used to measure the displacement of tissue resulting from a low frequency vibration of the tissue. We developed methods of vibrating tissue in the magnetic field of the MR system, developed the MR pulse sequences that measure the resulting displacement and developed the an algorithm to reconstruct the elasticity from the measured displacements. The algorithm to reconstruct the elasticity allows spatial resolution a factor of at least ten better than previous methods.
DTIC
Mechanical Properties; Anisotropy; Mammary Glands; Tissues (Biology); Cancer

20010020137 Michigan Univ., Ann Arbor, MI USA
Preclinical and Clinical Evaluation of Novel Agents for Noninvasive Imaging of Prostate Cancer ***Annual Report, 1 Aug. 1998-31 Jul. 1999***
Wahl, Richard L.; Aug. 1999; 16p; In English
Contract(s)/Grant(s): DAMD17-98-1-8528
Report No.(s): AD-A385690; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It is often impossible to optimally plan therapy for prostate cancer as current imaging is unreliable in determining if the cancer has spread beyond the prostate. Similarly, when prostate cancer recurs, as evidenced by a rising serum PSA level, non-invasively determining the precise location of the recurrence is often impossible. We have developed new radioactive compounds, NM404 and NM412, which are radioiodinated phospholipid ether analogs and have shown that they can localize to prostate cancer in rodent models of prostate cancer. We have recently shown that NM404 (1125 labeled) develops tumor uptake 37 times that of normal muscle, 9 times that of normal prostate and 3-11 times that of normal blood and liver, with 18% ID/g in the tumor at 5 days post injection. This level of targeting is considerably higher than most other radiopharmaceuticals. We also have completed pre clinical toxicology tests with the NM404 and NM412 reagents, which have shown no toxicity in doses up to 200 times that of the planned human dose in both rat and rabbit models. Dosimetry calculations for the radio labeled compounds have been completed. These data have allowed for development of protocols to begin human imaging studies, after appropriate approvals are obtained.
DTIC
Cancer; Prostate Gland; Clinical Medicine; Imaging Techniques; Pharmacology; Radioactive Isotopes

20010020138 California Univ., San Francisco, CA USA
Metalloprotease/Disintegrin Proteins and Mammary Carcinoma Progression ***Annual Report, 30 Sep. 1998-29 Sep. 1999***
Pytela, Robert; Oct. 1999; 10p; In English
Contract(s)/Grant(s): DAMD17-97-1-7154
Report No.(s): AD-A385686; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of this project is to identify members of the MDC protein family that are expressed in breast cancer tissue, to develop novel antibodies to them, and to determine their distribution in tumor tissue as well as in cultured breast cancer cell lines. As a model system for breast cancer progression, we are using transgenic mice that express the polyomavirus middle T oncogene in the mammary gland epithelium. Using the polymerase chain reaction (PCR), we have shown that MDC9 and MDC15 are expressed in mammary tumor tissue derived from these mice. We have raised polyclonal antibodies to synthetic peptides and

recombinant proteins, but these antibodies did not recognize the cognate antigens in mammary tumor tissue, presumably due to lack of cross-reaction with the native proteins. We have also raised panels of rabbit monoclonal antibodies to proteins expressed on the surface of mammary tumor cells, and have identified several of the corresponding antigens. We are continuing to screen these antibodies for reactivity with MDCs. In addition, we are using DNA immunization as a direct approach to raising anti-MDC monoclonal antibodies.
DTIC
Cancer; Cells (Biology); Mammary Glands; Proteins; Tissues (Biology)

20010020139 Florida Univ., Gainesville, FL USA
The Role of Cumulative Genetic Defects in NF1 Tumorigenesis ***Annual Report, 1 Oct. 1998-30 Sep. 1999***
Wallace, Margaret; Oct. 1999; 30p; In English
Contract(s)/Grant(s): DAMD17-98-1-8609
Report No.(s): AD-A385685; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The purpose of this work is to understand the genetic basis of tumor pathogenesis in neurofibromatosis type 1 (NE1) . This work will test the two-hit hypothesis in NE1 tumors (benign neurofibromas and MPNSTs), to assay for involvement of the TP53 gene in the various types of tumors, and to determine whether other loci contribute to the formation of NE1 tumors. This work is being done using human primary tumor samples, as well as using unique cell culture models derived from tumors and other sources of Schwann cells. The major accomplishments thus far include: strong evidence that the Schwann cell is genetically aberrant in neurofibromas and can be successfully enriched in culture (i.e., the clonal origin), that multiple genetic defects occur in many plexiform neurofibromas but that there is less evidence of large genetic rearrangements in dermal neurofibromas, that the two-hit hypothesis is supported in at least most tumors by genetic and protein assays, and that the TP53 gene is only abnormal in MPNSTs (the malignant tumors).
DTIC
Genetics; Tumors; Cells (Biology); Pathogenesis; Neurology

20010020140 California Univ., San Francisco, CA USA
Therapeutic and Biologic Studies in a Murine Model of NF1 ***Annual Report, 23 Sep. 1998-22 Sep. 1999***
Shannon, Kevin; Oct. 1999; 43p; In English
Contract(s)/Grant(s): DAMD17-98-1-8608
Report No.(s): AD-A385680; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes progress made during the first year of support for a translational research project involving Nf1 mutant mice with myeloid leukemia. This study has two Technical Objectives. First, examining the therapeutic efficacy of two agents: (1) mycophenolate mofetiel (MM), and (2) a fusion toxin that targets the GM-CSF receptor. These compounds represent rational new approaches for treating NF1-associated tumors. MM has been tested in the mouse model and our preliminary data indicate that it is unlikely to provide benefit to NF1 patients. We have also produced and purified the GM-CSF immunotoxin for use in preclinical studies during the next fund year. We are also performing correlative biochemical studies to elucidate the effects of these therapeutics on cellular GTP levels and Ras signaling. In aim 2, we are utilizing Nf1 mice to extend clinical observations suggesting that individuals with NF1 are susceptible to the development of therapy-associated second cancers. These studies were initiated over the past year. We will perform other correlative molecular studies in mice that develop tumors. We anticipate that the proposed experiments will yield novel data that may be of practical value to patients with NF1 and their physicians.
DTIC
Mice; Clinical Medicine; Leukemias; Therapy; Biochemistry

20010020141 Duke Univ., Medical Center, Durham, NC USA
Neuronal Degeneration in the Cingulate Gyrus: NMDA Antagonists and Anticholinesterases ***Annual Report, 30 Sep. 1999-29 Sep. 2000***
WIlson, Wilkie A.; Oct. 2000; 89p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9541
Report No.(s): AD-A385678; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The goal of this study is to understand the interact ion between drugs that are antagonists at the NMDA receptor subtype of glutamate receptors and drugs that are anticholinesterases. Previous research showed that NMDA antagonists are neurotoxic in the cingulate/retrosplenial cortex and that this toxicity was enhanced by muscarinic cholinergic agonists. We hypothesized that anticholinesterases would also enhance the toxicity of these compounds. We have used three approaches in this study: (1) We used intracellular electrophysiology; (2) We used imaging of brain slices treated with voltage sensitive dyes; and (3) We used a stain

(Fluro-Jade) which identifies dying neurons. Each of these approaches showed that NMDA antagonism produces excitability and/or neurotoxicity in these brain areas. Surprisingly, the anticholinesterase pyridostigmine appears to be inhibitory and preliminary studies suggest that it may protect against NMDA antagonist neurotoxicity. Our second year of experiments will continue this line of research.
DTIC
Cholinergics; Degeneration; Neurophysiology; Drugs; Receptors (Physiology)

20010020142 Virginia Commonwealth Univ., Richmond, VA USA
Apoptosis Based Gene Therapy of Breast Cancer ***Annual Report, 1 Aug. 1999-31 Jul. 2000***
Karp, Stephen; Aug. 2000; 6p; In English
Contract(s)/Grant(s): DAMD17-99-1-9428
Report No.(s): AD-A385619; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Conventional therapy for patients with metastatic breast cancer is unsuccessful as despite therapy with hormonal agents and chemotherapy virtually all patients die of their disease. This project is an attempt to develop a gene therapy for metastatic breast cancer that acts by selectively inducing apoptosis in breast cancer cells. Caspase-3, (c3), is a distal effector protein in the cascade that induces apoptosis. Expression of the c3 gene product is regulated by post translational cleavage and reassembly of the two fragments into the functional molecule. Our proposal is to develop a recombinant c3 without this regulatory domain that is constitutively active. We have tested several recombinant c3 molecules for caspase activity and ability to induce apoptosis. The experiments to date have demonstrated that a recombinant c3 named rev3 is indeed constitutively active in breast cancer cell lines and will be selected for further gene therapy experiments. Testing of our tumor and breast specific promoters, Hexokinase II and mammoglobin, confirm their activity, in and specificity for, breast cancer cells. We are now embarking on generating the adenoviral vectors for in vitro and in vivo preclinical testing.
DTIC
Apoptosis; Cancer; Genes; Mammary Glands; Clinical Medicine

20010020144 Boston Univ., Boston, MA USA
Mechanisms of Mechano-Transduction within Osteoblasts ***Annual Report, 1 Sep. 1999-31 Aug. 2000***
Gerstenfeld, Louis C.; Sep. 2000; 15p; In English
Contract(s)/Grant(s): DAMD17-98-1-8510
Report No.(s): AD-A385763; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mechanical stimulation is crucial to the homeostasis of adult bone density and mass. The hypothesis of this proposal is that bone cells sense their mechanical environment through specific cell surface receptors (integrins) that interact with specific extracellular matrix (ECM) proteins (osteopontin, bone sialoprotein, and fibronectin) that are the ligands for these receptors. We propose that the expression of these proteins is regulated in response to both cellular interactions with the ECM and mechanical stimulation. Thus, these proteins act like autocrine factors that modify cell behavior in response to changes in either matrix composition or mechanical deformation of the ECM itself. The proposed experiments will define how osteoblasts discriminate the molecular mechanisms by which mechanical signals mediat their actions through the cellular interactions of integrins with the ECM. A determination of the specific integrin isotypes that are involved in the mechano-signal transduction process will be made. The signal transduction system(s) that are responsible for mediating osteopontin, bone sialoprotein and fibronectin gene expression in response to mechanical stimulation, will be determined. Other experiments will examine how aspects of the mechanical stimuli, such as frequency, intensity or duration effect cell response. Knowledge gained from understanding mechano-signal transduction will facilitate the development of appropriate clinical approaches to enhance the adaptive responses of skeletal tissue to mechanical stimulation.
DTIC
Bones; Homeostasis; Musculoskeletal System

20010020147 Georgetown Univ., Washington, DC USA
A Novel Negative Regulator of Angiogenesis ***Annual Report, 1 Aug. 1998-31 Jul. 1999***
Li, Luyuan, Georgetown Univ., USA; Aug. 1999; 27p; In English
Contract(s)/Grant(s): DAMD17-98-1-8093
Report No.(s): AD-A385777; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The aim of this proposal is to purify a sufficient amount of VEGI, a novel inhibitor of angiogenesis we discovered recently, in order to determine its anticancer activity in animal models. Initially we planned to express the protein in insect cells; however, we found out that we can express the protein in E. coli with good yield and very high activity. We have developed two bench-top

procedures to purify VEGI protein. When expressed in E. coli, VEGI protein is basically found in the inclusion bodies. Upon refolding, the protein, which is tagged with 10-histidine residues at the N-terminus, is purified by a one-step affinity chromatography using Ni-sepharose resin. The second purification procedure involves dissolving the inclusion bodies in SDS and purify the denatured VEGI protein by using a gel filtration column; the purified VEGI protein is then refolded by dilution (Scheme 2). The yield from either procedure is 2-5 mg/L, which is reasonable for bench-top production. The specific activity of the protein preparation, as determined by the IC50 value for the inhibition of endothelial cell growth, is 6 ng/ml, representing nearly 500-fold improvement as compared to our earlier preparations. These procedures are simple and ready for scale-up studies.
DTIC
Cancer; Blood Vessels; Proteins; Purification; Inhibitors; Chromatography; Cell Division

20010020159 Stanford Univ., Stanford, CA USA
Prostate Cancer Prevention Through Induction of Phase 2 Enzymes ***Annual Report, 1 Oct. 1998-30 Sep. 1999***
Brooks, James D.; Oct. 1999; 14p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8555
Report No.(s): AD-A385367; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Virtually all human prostate cancers harbor a common somatically acquired genetic lesion loss of expression of the carcinogen defense enzyme glutathione S-transferase-pi (GST-pi) due to methylation of deoxycytidine residues in the promoter region of the gene. We have hypothesized that this lesion, acquired early in prostate carcinogenesis, renders prostate cells susceptible to accumulating genetic damage and ultimately to frank carcinoma. We propose to investigate whether a suitable prostate cancer preventive strategy could involve up-regulation of global carcinogen defenses (phase 2 enzymes) by chemical or dietary means. Over the past year, we have made extraordinary progress in developing this hypothesis. We have identified sulforaphane, a dietary isothiocyanate found in cucifers, as the most potent phase 2 enzyme inducing agent in human prostate cancer cell lines compared to over 50 other compounds screened in our laboratory. Sulforaphane readily induced increased expression of quinone reductase, GST-alpha, and gamma glutamylcysteine synthase, the rate limiting enzyme in glutathione synthetic pathways.
DTIC
Enzymes; Prostate Gland; Cancer; Medical Science; Carcinogens

20010020160 Sloan-Kettering Inst. for Cancer Research, New York, NY USA
Synthesis of Clustered ST-Antigens for the Development of Novel Breast Cancer Vaccines ***Annual Report, 16 Mar. 1998-15 Mar. 1999***
Kuduk, Scott D.; Danishefsky, Samuel; Apr. 1999; 42p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8154
Report No.(s): AD-A385369; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The development of efficient routes for the preparation of complex oligosaccharide or carbohydrate conjugates has been our immediate purpose. A more global goal would be that of recruiting the immune system to respond to malignant lesions. In our continuing chemical studies, we have undertaken to develop synthetic methodology of general applicability for the preparation of carbohydrates, in the form of glycolipids and glycopeptides, which mimic components of the accessible cell surface of tumor cells. The report herein focuses on successful syntheses of mucin related 0-linked glycopeptides, in particular the TF and 2,3-STF antigens. TF is observed on a variety of epithelial tumors and 2,3-STF is observed on a large number of breast tumors.
DTIC
Carbohydrates; Antigens; Vaccines; Mammary Glands; Cancer; Medical Science

20010020161 Thomas Jefferson Univ., Philadelphia, PA USA
Transcriptional Regulation of BRCA1 ***Annual Report, 20 Jul. 1998-19 Jul. 1999***
Thakur, Sanjay; Croce, Carlo; Aug. 1999; 12p; In English
Contract(s)/Grant(s): DAMD17-98-1-8170
Report No.(s): AD-A385370; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The principal aim of my project was to characterize the transcriptional regulation of the breast cancer susceptibility gene, BRCAl. This purpose of the project has gained greater importance in light the following observations by several laboratories: (1) A significant number of higher grade breast cancers have decreased expression of BRCAl mRNA and proteins and (2) BRCAl transcriptional promoters have been reported to be methylated in some sporadic breast cancers as opposed to lack of metylation in normal breast tissues. These studies suggested that suppression of BRCAl transcription may contribute to the development of

a subset of breast cancer. Therefore, the present studies may not only give greater insight into the functional pathways in which BRCAl participates in, but also provide clues regarding the pathogenesis of breast neoplasms.
DTIC
Genes; Mammary Glands; Cancer; Medical Science; Proteins

20010020162 Ohio State Univ., Columbus, OH USA
Gene Regulation by Retinoid Receptors in Human Mammary Epithelial Cells ***Annual Report, 25 Sep. 1998-24 Sep. 1999***
Seswaltdt, Victoria L.; Lang, Jas; Oct. 1999; 9p; In English
Contract(s)/Grant(s): DAMD17-98-1-8351
Report No.(s): AD-A385371; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Retinoids are important mediators of normal growth and differentiation of epithelial cells and may play an important role in the chemoprevention of breast cancer. While normal mammary epithelial cells express retinoic acid receptors (RAR) a majority of breast cancers have selectively lost the expression of specific RAR isoforms. In order to investigate the molecular mechanisms by which loss of retinoic acid receptor function might promote the malignant transformation of mammary epithelial cells, we have inhibited retinoic acid receptor function in normal human mammary epithelial cells (HMECs). We observe that suppression of retinoic acid receptor function in HMECs results in dysregulated growth and inhibits structural differentiation. These observations lead us to hypothesize that retinoids and retinoic acid receptors may be important in regulating mammary epithelial cell growth and differentiation. and therefore, loss of retinoic acid receptor function might promote breast cancer carcinogenesis. The aim of this proposal is to identify and characterize genes activated or suppressed by loss of retinoic acid receptor function in human mammary cells. It is our hope that these studies will facilitate the understanding of normal mechanisms controlling growth and differentiation of HMEOs and provide insight into how these normal processes may be altered in breast cancer.
DTIC
Growth; Cancer; Epithelium; Genes; Cells (Biology); Mammary Glands; Retinene

20010020163 Washington Univ., Saint Louis, MO USA
Impact of Feature-Based Training and Auditing on Diagnostic Accuracy and Agreement in Mammographic Interpretations ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Farria, Dione M.; Jul. 2000; 29p; In English
Contract(s)/Grant(s): DAMD17-99-1-9435
Report No.(s): AD-A385372; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objectives of this study are: (1) to obtain practical experience with patient outreach and educational program development for breast imaging and breast cancer patients; and (2) to further develop public health research skills by conducting a series of small projects in the field of breast imaging, with an emphasis on the educational needs of underserved women.
DTIC
Cancer; Diagnosis; Mammary Glands; Education

20010020164 Wayne State Univ., Detroit, MI USA
Modeling Differential Rates of Increase of Serial PSA in African Americans and Caucasians Following Radical Prostatectomy ***Final Report, 1 Jan.-31 Oct. 1999***
Banerjee, Mousumi; Nov. 1999; 21p; In English
Contract(s)/Grant(s): DAMD17-99-1-9036
Report No.(s): AD-A385373; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Prostate cancer is currently the most common malignant neoplasm and the second leading cause of cancer-specific death among males in the USA. African American men (AAM) have higher incidence and mortality from prostate cancer than Caucasian men (CM). Outcome data of men treated with radical prostatectomy for clinically localized prostate cancer also demonstrate more advanced tumors at diagnosis, and for each pathologic stage, AAM have higher recurrence rates than CM. Given the differential disease outcome in the two races, it is conceivable that race may have an effect on the rate of progression in patients that experience biochemical recurrence following surgery. The proposed study models follow-up prostate specific antigen (PSA) measurements to characterize the pattern of progression in patients who suffer biochemical recurrence. Relative rates of progression are also derived for AAM and CM. Based on longitudinal data analysis, the current study did not find any statistically significant difference in the post-surgery relative rates of progression between the two races. Results from this research does not warrant the need for

earlier therapeutic intervention in AAM compared to CM who demonstrate signs of rising PSA following radical prostatectomy for clinically localized prostate cancer.
DTIC
Antigens; Cancer; Prostate Gland; Races (Anthropology); Survival

20010020165 Health Research, Inc., Buffalo, NY USA
Identifying and Isolating Breast Cancer-Associated Genes on Chromosomes ***Final Report, 1 Oct. 1994 - 30 Sep. 1999***
Shows, Thomas B.; Oct. 1999; 90p; In English
Contract(s)/Grant(s): DAMD17-94-J-4417
Report No.(s): AD-A385374; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy
A region on human chromosome ii at plS.S is associated with breast cancer. Metastasis and poor outcome are the cancer phenotypes associated with this region. This is a study to identif
DTIC
Mammary Glands; Cancer; Genes; Chromosomes; Identifying

20010020166 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA
Targeting Human Breast Cancer Cells that Overexpress HER-2/neu mRNA by an Antisense Iron Responsive Element ***Annual Report, 1 Jun. 1999 - 31 May 2000***
Yan, Duen-Hwa; Jun. 2000; 26p; In English
Contract(s)/Grant(s): DAMD17-99-1-9270
Report No.(s): AD-A385375; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
Amplification and overexpression of the HER-2/neu gene were found in 20-30% of patients with breast cancer, and is an indicator for poor prognosis of the disease. to target the breast cancer cells-overexpressing HER-2/neu mRNA, a novel approach was developed. We combine the antisense principle and the biochemical property of a translation regulator, an iron responsive element (IRE) to preferentially express therapeutic gene in HER-2/neu overexpressing breast cancer cells. Briefly, IRE, when placed 5 to a gene, functions as a negative translation regulator in that IRE interacts with iron-regulatory proteins (IRPs) and this protein-RNA complex blocks translation. One way to alleviate this translation inhibition is to prevent the IRE/IRP interaction by disrupting the IRE stem-loop structure via a sense-antisense hybrid. Thus, we designed a HER-2/neu antisense IRE (AS-IRE) that possesses the IRE consensus sequence and functions as a translation inhibitor. When placed 5 to a reporter gene, AS-IRE could direct the reporter gene expression in breast cancer cells that overexpress HER-2/neu mRNA, because the AS-IRE-mediated translation inhibition can be overcome by the overexpression of HER-2/neu mRNA. In this project, we attempt to demonstrate the utility of this novel approach in vitro and in vivo by specifically directing gene expression in HER-2/neu-overexpressing breast cancer cells.
DTIC
Mammary Glands; Cancer; Iron; Gene Expression

20010020174 Dana Farber Cancer Inst., Boston, MA USA
Angiogenisis Targeted Gene Therapy ***Annual Report, 1 Oct. 1998-30 Sep. 1999***
Fine, Howard A.; Oct. 1999; 8p; In English
Contract(s)/Grant(s): DAMD17-98-1-8059
Report No.(s): AD-A385354; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The growth of most solid tumors, including breast carcinoma, is highly dependent of the development of vascular structures to support the increasing need of the tumor for nutrients and oxygen, a process called angiogenesis. In adults, physiologic angiogenesis occurs only during limited times thus making angiogenesis a rather tumor-selective process, and therefore, a promising therapeutic target for cancer therapy. It has been recently demonstrated that endothelial progenitor cells (EPCs), or angioblasts, can be easily detected and isolated from the peripheral blood of adult mice and humans. It can be shown that following systemic injection into the circulation of an animal, EPCs can migrate to areas of angiogenesis. We, therefore, hypothesized that EPCs, first transduced in vitro with a prodrug activating or anti-angiogenic gene and then re-injected back into the host, could be utilized as a selective tumor targeting 'vector' by migrating into, and delivering the therapeutic gene to areas of tumor-associated angiogenesis.
DTIC
Genes; Mammary Glands; Endothelium; Cancer; Therapy; Tumors; Medical Science

20010020183 University of Southern California, Los Angeles, CA USA

Improving Detection of Axillary Lymph Nodes by Computer-Aided Kinetic Feature Identification in Positron Emission Tomography ***Annual Report, 1 Aug. 1999-31 Jul. 2000***

Yu, Xiaoli; Aug. 2000; 71p; In English

Contract(s)/Grant(s): DAMD17-99-1-9379

Report No.(s): AD-A385393; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This project seeks to improve detection of metastatic axillary breast cancer and decrease a number of unnecessary breast biopsies through developing a sophisticated statistical signal processing system to aid identification of metabolic information within dynamic PET data. This Year 1 effort has been concentrated on mathematical modeling, validity analysis and algorithm development. We have found some interesting, natural relationship of conventional PET-FDG kinetic modeling to subspace representation in linear algebra. by representing time-activity curves of normal and malignant tissues with distinct subspaces, the distance between the subspaces can quantitatively characterize the difference between normal and malignant tissues as well as the similarity between primary and metastatic lesions. It turns out that OSEM outperforms FBP in revealing such difference and similarity. to accelerate the subspace estimation performed on a fully reconstructed dynamic image sequence, the validity of estimating parameters directly from projection data prior to the image reconstruction has been studied. With such estimations, a data compression algorithm has been developed for a fast dynamic image reconstruction, which maximizes the signal-to-noise ratio (SNR) . DTIC

Cancer; Mammary Glands; Computer Techniques; Medical Science; Medical Equipment

20010020184 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA

Fluorometric Assay for Intracellular pH in Human Epidermal Keratinocytes, ***Jul. 1997-Sep. 1999***

deJoseph, Maura E.; Smith, William J.; Jan. 2000; 17p; In English

Contract(s)/Grant(s): Proj-30162384ATC2

Report No.(s): AD-A385396; USAMRICD-TR-00-05; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Sulfur mustard (HD) is a powerful alkylating agent with cytotoxic, mutagenic, and vesicant properties. Pathology in humans results from ocular, respiratory, and cutaneous exposure. Basal cells of the epidermis of the skin are damaged by exposure to HD, causing large, slow healing blisters. to protect individuals from the effects of HD, the mechanism by which it induces pathology must be determined. In this report, a fluorometric assay of intracellular pH was developed and used to examine the role of intracellular pH in cutaneous cellular toxicity. HD undergoes a hydrolysis reaction in aqueous environments, generating thiodiglycol, protons, and chloride ions. One hypothesis of HD injury postulates the formation of hydrochloric acid (HCl), which could acidify surrounding cell and tissue milieu. All cellular metabolic pathways are dependent on carefully buffered systems that maintain the intracellular pH within strict boundaries. Any disruption in pH regulation has the potential to result in cell or tissue injury. The effect of HD on intracellular pH had not been previously examined. The value of fluorescent assays is in their sensitivity and specificity. Using fluorescent probes capable of crossing the cell membrane and becoming trapped within the cytoplasm, we were able to directly determine proton concentrations within the cytoplasm and could determine intracellular pH levels before and after exposure to HD in vitro. While small changes in pH were noted, they were not determined to be of biological significance. We suggest, therefore, that vesicating agents do not produce their toxicity through alteration of intracellular pH.
DTIC

Sulfur; pH Factor; Epidermis; Acetic Acid; Healing; Exposure; Membranes

20010020185 Army Medical Research Inst. of Chemical Defense, Aberdeen Proving Ground, MD USA

Effects of Methemoglobin Formers on Spontaneous Locomotor Activity and Methemoglobin Levels in Mice, ***1994-1996***

Rockwood, Gary A.; Baskin, Steven I.; Romano, James A., Jr.; Murrow, Melanie L.; Jan. 2000; 19p; In English

Contract(s)/Grant(s): Proj-30162384ATC2

Report No.(s): AD-A385397; USAMRICD-TR-00-06; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cyanide (CN) remains a viable threat as a chemical warfare agent. Methemoglobin (MHb) formation is one strategy used to counter CN toxicity. It has been suggested that blood levels of 5-12% MHb will protect a human against a 2X MLD (median lethal dose) of CN. Available MHb formers present certain drawbacks and limitations. to identify improved MHb formers, we characterized the locomotor activity effects and MHb formation capacity of three MHb formers with established efficacy against CN (p-aminopropiophenone PAPP, p-aminoheptanoylphenone PAHP and p-aminooctanoylphenone PAOP) as a function of time, dose (9.4-125.0 mg/kg) and route of administration (IM versus IP). Mice received a single injection of a test compound or its solvent, and were either placed in an automated activity monitoring chamber for one hour or monitored for MHb levels for three hours. Sodium nitrite (100 mg/kg) served as the positive control. Dose-related MHb formation was observed for each compound. A typical time-dependent decline in activity was exhibited in negative control groups and in drug-treated groups that exhibited

greater than 20% MHb. A route of administration effect was also observed with PAHP and PAOP. These locomotor activity data, combined with other findings, support the idea that compounds producing low MHb levels can be effective against CN without debilitating side effects.
DTIC
Toxicity; Cyanides; Chemical Warfare; Dosage

20010020188 New York Univ., School of Medicine, New York, NY USA
Complement Inhibitory Membrane Proteins and Their Role in Tumorigenesis ***Annual Report***
Tomlinson, Stephen; Sep. 2000; 17p; In English
Contract(s)/Grant(s): DAMD17-99-1-9325
Report No.(s): AD-A385415; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to determine the role of complement and complement inhibitors in tumorigenesis and to determine whether reversing the effects of tumor-expressed complement inhibitors will allow effective immune-mediated clearance of tumor cells. The work proposed is based on developing rodent models of human breast cancer in which human tumor cells express rodent complement inhibitors. Toward the project aims, we have: (1) Transfected various human breast cancer cell lines with rodent complement inhibitors and isolated stably expressing cell lines; (2) Shown that the expression of rat complement inhibitors on human breast cancer cells (and a neuroblastoma cell line) protects transfected cells from lysis by rat complement; and (3) Established rat models of human cancer and demonstrated for the first time in vivo that a complement inhibitor expressed on a tumor cell surface can promote tumor growth. Our data strengthen the hypothesis that the modulation of complement inhibitors on a tumor cell surface will provide an effective therapy when combined with complement-activating anti-tumor antibodies. Neutralization of complement regulatory proteins may also enhance a normally ineffective cytolytic humoral immune response.
DTIC
Cancer; Mammary Glands; Models; Cells (Biology); Inhibitors; Proteins

20010020189 Emory Univ., Atlanta, GA USA
Fruit and Vegetable Intake and Prostate Cancer Outcomes Among African American Men ***Final Report, 15 Jan. 1999-31 Oct. 1999***
Stephens, Torrance T.; Nov. 1999; 28p; In English
Contract(s)/Grant(s): DAMD17-99-1-9037
Report No.(s): AD-A385416; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study was conducted to evaluate the impact of dietary behaviors, specifically fruit and vegetable consumption, on outcomes of prostate cancer (PC) among a random sample of African American (AA) men. The goal was to determine how fruit and vegetable behavior might enhance treatment outcomes and the quality of life among AA men. Currently it is unknown how culturally-specific dietary behaviors impact treatment outcomes for PC for AAs. The parent study was a four-year study, conducted through black churches located in Atlanta, GA, and maintained two specific aims: (1) to develop a multicomponent, culturally-sensitive nutrition intervention package (TX) for AAs, and (2) to evaluate the feasibility and efficacy of the intervention. Primary outcome variables for the study which included servings of fruit and vegetables, total fat and fiber intake, serum cholesterol and serum carotenoids. Given the small number of men who reported a history of being treated for PC (n = 2), we were not able to test the mediation impact of dietary practice on PC outcomes. However, as anticipated, those men who reported being treated for PC tended to be older, and to maintain lower blood pressure and levels of cholesterol. We were able to evaluate a profile of those men who were likely to get screened for PC compared to those who were not. Participants who had been screened for PC were approximately 12 years older, had a somewhat higher systolic blood pressure, level of cholesterol and body mass index (BMI). Fifty percent (50.6%) of respondents reported ever being screened for PC. of those reporting being screened for PC, 64.0% indicated having a PSA compared to 51.3% for those that had a DRE conducted.
DTIC
Cancer; Diets; Nutrition; Prostate Gland; Medical Science

20010020190 Duke Univ., Durham, NC USA
Caspase Pro-Domains and the Regulation of Apoptosis ***Annual Report, 1 Jul. 1998-30Jun. 1999***
Korobluth, Sally A.; Jul. 1999; 24p; In English
Contract(s)/Grant(s): DAMD17-99-1-8073
Report No.(s): AD-A385417; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Apoptosis is a program of cellular suicide triggered in response to developmental cues, specific signaling events, and cellular insult. Tumor development results from both excess cellular proliferation and a failure of cells to die on schedule by apoptosis.

In cancer chemotherapy, it is believed that apoptotic elimination of cells in response to drug-induced damage accounts for much of the treatment efficacy. This project uses a novel in vitro system for studying apoptosis to examine the regulation of the main executioners of apoptosis, the caspases. These enzymes are synthesized as inactive zymogens. In several well-documented cases, it has been shown that the pro-domains present in the inactive pro-caspases regulate caspase activation through the binding of pro- and anti-apoptotic molecules. It is the goal of this project to identify and characterize molecules which regulate apoptotic progression through interaction with the procaspase pro-domains.
DTIC
Cancer; Apoptosis; Mammary Glands

20010020193 Kentucky Univ., Research Foundation, Lexington, KY USA
Research Training in Bipsychosocial Breast Cancer Research ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Andrykowski, Michael; Jul. 2000; 13p; In English
Contract(s)/Grant(s): DAMD17-99-1-9245
Report No.(s): AD-A385458; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes activities and accomplishments during the first year of a four year predoctoral and postdoctoral research training program in biopsychosocial aspects of breast cancer. Two predoctoral trainees were appointed during the initial year of the training program. Research training was provided by a multidisciplinary faculty of six. The training program consists of five integrated components. These include: (1) training in research design, methods, and analysis through supervised participation in BC-related research; (2) formal coursework; (3) individual tutorial in BC-related research; (4) participation in a monthly BC seminar; and (5) education regarding biological and medical aspects of BC. Each of these components was effectively implemented during the initial year of the training program. In general, the training program requires trainees to participate in all phases of the research enterprise including protocol development, obtaining approval for use of human subjects, data collection, data preparation, entry, and analysis, and manuscript preparation. Two new predoctoral trainees and a postdoctoral trainee were recruited and were appointed to the training program for the second project year.
DTIC
Cancer; Mammary Glands; Psychological Factors; Social Factors; Education

20010020196 Wake Forest Univ., Bowman Gray School of Medicine, Winston-Salem, NC USA
Oral Contraceptives Use by Young Women Reduces Peak Bone Mass ***Annual Report, 1 Sep. 1999 - 31 Aug. 2000***
Register, Thomas; Sep. 2000; 31p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8514
Report No.(s): AD-A385466; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of the proposed studies was to determine the role that hypoandrogenemia plays in the effects of oral contraceptives (OC) on bone metabolism and peak bone mass (PBM) in young female rats. Intact, adolescent/young adult Sprague-Dawley rats were treated with: (1) placebo, (2) OC therapy, (3) OC supplemented with an androgen (methyltestosterone), or (4) anti-androgen therapy (bicalutamide) to determine the potential role that suppression of androgens plays on bone metabolism, bone architecture, and the attainment of PBM. Our specific aims were to determine: (1) If oral contraceptive steroid (OC) use leads to decreased peak bone mass in young intact female rats. Findings: OC use decreased the peak bone mass of young intact female rats. (2) If the addition of a non-aromatizable androgenic steroid to OCs prevents the detrimental effects of OC use on peak bone mass. Findings: The non-aromatizable androgenic steroid did not pre vent the adverse effects of OCs to the growing skeleton of young rats at the dose used. (3) If the effects of OC use on peak bone mass are equivalent to the effects caused by anti-androgen use. Findings: The anti-androgen used did not mimic the adverse effect of OCs on the growing skeleton of young rats.
DTIC
Musculoskeletal System; Bones; Drugs; Rats

20010020197 Louisiana State Univ., Health Sciences Center, Shreveport, LA USA
Identification of Secondary Mutations Which Enhance and Stabilize the Attenuation of Brucella HTRA Mutants: Improving Brucella HTRA-Based Strains as Vaccine Candidates ***Annual Report, 1 Aug. 1999 - 31 Jul. 2000***
Roop, R. M.; Aug. 2000; 28p; In English
Contract(s)/Grant(s): DAMD17-98-C-8045
Report No.(s): AD-A385505; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Results to date from the studies funded under this contract suggest that Brucella genes involved in maintaining efficient stationary phase physiology and allowing the brucellae to make effective use of the nutrients available in the phagosomal compartment make good targets for the construction of mutants with defined levels of attenuation which may prove useful as vaccine

candidates. For example, the well characterized antioxidants KatE and SodC protect B. abortus from reactive oxygen intermediate (ROI)-mediated killing in in vitro assays, but experiments employing katE and sodC mutants indicate that these antioxidants are probably more important for protecting the intracellular brucellae from the endogenous ROIs generated by stationary phase metabolism than they are for detoxifying the products of the oxidative burst of host macrophages. The brucellae also experience significant nutrient deprivation in the phagosomal compartment, and preliminary results suggest that the bacA gene product functions in iron acquisition in this environment. Tn5 mutants of B. abortus which display nutritional defects in vitro and are unable to survive and replicate in cultured murine macrophages have also been identified and are presently being characterized.
DTIC
Vaccines; Mutations; Genes; Bacteria; Assaying; Antioxidants

20010020198 Georgetown Univ., Medical Center, Washington, DC USA
A Gene Amplification Phenotype in c-Myc-Induced Mammary Tumors Cells ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Sheen, Joon-Ho; Jul. 2000; 20p; In English
Contract(s)/Grant(s): DAMD17-99-1-9205
Report No.(s): AD-A385508; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

c-Myc has been implicated in breast cancer as the oncoprotein is overproduced in nearly 80% of the breast cancer cells. c-Myc constitutes a transcription factor, modulating transcription of cell cycle-related target genes, and facilitating cell cycle progression. Deregulated c-Myc also promotes genomic instability with unknown mechanism(s). Genomic instability has been implicated as a driving force for the tumorigenesis. For the creation of permissive conditions for the gene amplification, a form of genomic instability, the abrogation of cell-cycle checkpoint controls is recognized as a prerequisite. Checkpoint control arrests cells with DNA damage, such as broken chromosomes, that are important intermediates in gene amplification. The focus of the current study is investigating if c- Myc abrogate the checkpoint to DNA damage, creating the permissive conditions for gene amplification. With a carefully controlled set of cell lines, established by retroviral transfection of c-Myc and c-MycS (N-terminally truncated c-Myc), we identified that both Myc-Box T and II are required to alter the checkpoint at the G1/S boundary. This should help finding a novel target for the prevention of the gene amplification and arrest of proliferation of tumor cells with the phenotype. The current research provides me an invaluable experience for both conceptual and technical training.
DTIC
Mammary Glands; Cancer; Deoxyribonucleic Acid; Chromosomes; Genes

20010020199 Georgetown Univ., Medical Center, Washington, DC USA
A New APC-like Gene Involved in Regulation of B-catenin/LEF ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Jarrett, Christy; Jul. 2000; 56p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9197
Report No.(s): AD-A385511; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A second adenomatous polyposis coli (APC)-like gene, APC2, was recently described and localized to chromosome 19. We have now fine mapped APC2 to a small region of chromosome 19p13.3 containing markers D19S883 and WI-19632, a region commonly lost in a variety of cancers. APC2 is expressed in many different tissues and cell lines including brain, breast, colon, and ovary. Endogenous APC2 is diffusely distributed in the cytoplasm and co-localizes with both the Golgi apparatus and actin filaments. Unlike APC, APC2 and beta-catenin remained associated with actin filaments following treatment with the actin-disrupting agent, cytochalasin D. In addition, APC2 co-localizes with beta-catenin and actin filaments at the membrane of SKBR3 cells upon retinoic acid treatment. Like APC, APC2 has the ability to down-regulate beta-catenin signaling and is sensitive to the PKC inhibitor bisindoylmaleimide. APC2 is more sensitive than APC to inhibition of GSK3 with LiCl and, unlike APC, can inhibit the signaling activity of a S37A mutant form of beta-catenin. These results suggest that APC2 is involved in actin associated events and could influence cell motility through interaction with actin filaments as well as functioning independently or in cooperation with APC to down- regulate beta-catenin signaling.
DTIC
Cancer; Mammary Glands; Genes; Chromosomes

20010020201 Cold Spring Harbor Lab., New York, NY USA
Investigation of the Causes of Breast Cancer at the Cellular Level: Isolation of In Vivo Binding Sites of the Human Origin Recognition Complex ***Annual Report, 1 Jul. 1999 - 1 Jul. 2000***
Mendez, Juan; Stillman, Bruce; Aug. 2000; 12p; In English
Contract(s)/Grant(s): DAMD17-99-1-9138
Report No.(s): AD-A385517; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The coordination between cellular DNA replication and mitosis is critical to ensure controlled cell proliferation and accurate transmission of the genetic information as cells divide -two aspects of cellular life tipically lost in cancer. In order to unravel the molecular mechanisms of human DNA replication in normal and cancer cells, we have started a search for human DNA sequences that serve as replicators", this is, binding sites for human proteins involved in the initiation of DNA replication. Preliminary results are presented.
DTIC
Cancer; Mammary Glands; Deoxyribonucleic Acid; In Vivo Methods and Tests

20010020202 New York Univ., School of Medicine, New York, NY USA
TGF-B and Breast Cancer Induction ***Annual Report, 1 Jul.-30 Jun. 2000***
Dabovic, Branka B.; Jul. 2000; 12p; In English
Contract(s)/Grant(s): DAMD17-99-1-9319
Report No.(s): AD-A385519; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The breast produces inhibitors of breast tumor formation. We hypothesized increasing the amount of these compounds would delay cancer onset. We study the molecule TGF-Beta which blocks cell growth. TGF-Beta is produced as latent TGF-Beta complex consisting of the TGF-Beta homodimer, the TGF-Beta propeptide dimer, and a second gene product, the latent TGF-Beta binding protein (LTBP). LTBP targets latent TGF-Beta to the extracellular matrix, from which active TGF-Beta is released. The third cysteine rich repeat (CR3) of LTBP-1 is necessary and sufficient for covalent interaction with small latent TGF-Beta. CR3 overexpression should result in the TGF-Beta propeptide complexing to an LTBP form unable to interact with matrix. Therefore, TGF-Beta in this complex should be more easily activated. We generated mice overexpressing CR3 under the control of breast specific WAP promotor, and will generate mice overexpressing CR3 under the control of MMTV LTR. We will study whether breast cancer occurrence is delayed compared to wt animals. We will test whether tamoxifen treatment, which prevents breast cancer, and overproduction of TGF Beta in genetically engineered mice block tumorigenesis better than either condition alone.
DTIC
Cancer; Mammary Glands; Physiology

20010020203 Sunnybrook and Women's Coll. Health Sciences Centre, Toronto, Ontario Canada
MRI Assessment of the Viscoelastic Properties of Normal and Abnormal Breast Tissue ***Annual Report, 1 Jul. 1999 - 30 Jun. 200***
Plewes, Donald B.; Jul. 2000; 17p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9391
Report No.(s): AD-A385526; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The biomechanical properties of breast tissue represent an attractive property by which to detect disease and aid in differentiation between normal and benign breast tissues. Objective measurements of breast tissue biomechanical properties have been attempted in the past based on ex-vivo tissue samples. While these studies indicate large variations in breast tissue elastic modulus among various breast tissues, these data are subject to sampling errors arising from tissue heterogeneity within the tissue samples and potential differences arising from ex-vivo conditions. In this project, we aim to study these properties with an MRI method, both in-vitro and in-vivo, and assess the biomechanical properties of fat, fibroglandular and cancerous breast tissues. During our first year of funding, we have initiated the development of two uni-axial loading systems, an MRI-based imaging approach and a table-top system, for more conventional uni-axial loading measurements. In addition, we developed various inverse solution algorithms for reconstruction of elastic modulus derived from strain data acquired by MRI data. Finally, we optimized a software system for meshing that takes MRI breast images and converts them to a suitable mesh for finite element deformation analysis.
DTIC
Mammary Glands; Cancer; Abnormalities; Imaging Techniques; Finite Element Method; Computer Programs

20010020247 West Virginia Univ., Morgantown, WV USA
Induction of Radiosensitization by Antisense Oligonucleotide Gene Therapy ***Annual Report, 1 Jul. 1999-30 Jun. 00***
McCracken, Meredith; Jul. 2000; 15p; In English
Contract(s)/Grant(s): DAMD17-99-1-9449
Report No.(s): AD-A385376; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The enzyme, protein kinase C (PKC), is composed of a family of at least 11 isoforms which have distinct functions in signal transduction, tumor progression, and apoptosis. Elevated levels of PKC have been observed in breast cancers. The purpose of this project is to enhance radiation treatment through the use of isoform specific PKC inhibitors. Human breast tumor cell lines were treated with isoform specific AO (antisense oligonucleotides) and radiation. Cell survival and PKC isoform protein reduction were

measured. Future experiments will address DNA damage following AO and radiation treatments as well compare the effectiveness of AO, chemical PKC inhibitors, and dominant negative PKCs in augmentation of radiation induced cell death. Results show that inhibition of PKC sigma and zeta by AO in combination with radiation treatment significantly reduces cell survival in two distinct breast tumor cell lines, while inhibition of PKC alpha, epsilon, or eta does not. Western blotting shows that AO are effective inhibitors of PKC isoforms, with PKC a and protein levels markedly reduced by AO treatment. These results support the use of isotype specific PKC inhibitors in combination with radiation treatment as a potential cancer therapy.
DTIC
Cancer; Cells (Biology); Mammary Glands; Medical Science; Inhibitors; Proteins; Survival

20010020248 Dartmouth Coll., Hanover, NH USA
Targeting a Novel Vector for Breast Cancer Gene Therapy ***Annual Report, 15 Jul. 1999-14 Jul. 00***
Bzik, David; Aug. 2000; 13p; In English
Contract(s)/Grant(s): DAMD17-99-1-9167
Report No.(s): AD-A385377; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We are testing the hypothesis that a model parasite gene therapy vector can be genetically altered to safely, specifically and effectively target breast cancer cells in vitro and in vivo. We have developed a novel strategy to establish the protozoan parasite T gondii as the next generation vector for breast cancer gene therapy. The significant innovative aspect of this approach is the promise of this strategy to deliver a novel vector for breast cancer gene therapy that is superior to the current vectors under current development and refinement. The primary purpose and scope of this IDEA award project is to experimentally examine approaches to target the Toxoplasma gondii parasite gene therapy vector to breast cancer tissue using in vitro and in vivo models. In this reporting period we have found that both the cytosine deaminase (CD) and thymidine kinase (TK) markers expressed in T gondii produce a bystander killing effect on cells in vitro. Using trifunctional ezyme expression plasmids we have co-expressed both the TK and CD markers in transgenic T gondii. A newly developed and highly attenuated (avirulent) auxotroph mutant of T gondii will provide an improved vector for targeting breast cancer gene therapy.
DTIC
Tissues (Biology); Therapy; Cancer; Cells (Biology); Mammary Glands; Medical Science

20010020249 Wayne State Univ., Detroit, MI USA
Development of Pro-Peptide Immunotherapy for Breast Cancer ***Annual Report, 1 Jul. 1999-30 Jun. 00***
Wei-Zan, Wei; Jul. 2000; 43p; In English
Contract(s)/Grant(s): DAMD17-99-1-9244
Report No.(s): AD-A385378; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study tests whether breast cancer can be eliminated by immunization with foreign peptides followed by delivery of peptides to tumors. We proposed to: (1) establish an in vitro assay to measure tumor growth inhibition, (2) synthesize pro-peptides for activation at the tumor site by beta-glucuronidase, and (3) test tumor rejection with peptide therapy. The 3-D tumor growth inhibition assay is established. D2F2 mammary tumor and another tumor line 168 with metastatic potential were inhibited by CTL in the 3-D matrix. HLA-A2.l associated Flu peptide MP-58 GILGFVFTL was used for pro-peptide development. Pro-peptide was synthesized with a minimal protection approach. Purification of the pro-peptide to high purity is the current goal. to test therapeutic effect, mice were immunized with MHC Ip876 and MHC II PADRE, injected with peptide loaded tumor cells, followed by local peptide injections. Complete tumor rejection was achieved. Challenging tumor cells not pre-coated with peptide were not rejected by p876 treatment. Vaccination and therapy with PADRE alone demonstrated anti-tumor effect and this activity is being further pursued. If MRC I peptide can be delivered directly unto tumor cells in the form of pro-peptide, combined treatment with PADRE may exert enhanced efficacy.
DTIC
Peptides; Cancer; Cells (Biology); Growth; Mammary Glands; Medical Science; Tumors

20010020250 Columbia Univ., New York, NY USA
Cytochrome P450-17alpha Polymorphism and Risk of Breast Cancer ***Annual Report, 1 Aug. 1998-31 Jul. 1999***
Ahsan, Habibul; Aug. 1999; 6p; In English
Contract(s)/Grant(s): DAMD-17-98-1-8050
Report No.(s): AD-A385380; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The current study investigates whether polymorphisms in the CYP 17 gene, which plays roles in estrogen biosynthesis, are associated with an altered risk of breast cancer in a population-based sample of women (400 cases and 400 controls) who participated in the Long Island Breast Cancer Study Project (LIBSCP). In addition, we are also exploring whether the effects of reproduc-

tive risk factors and exposure to exogenous estrogen are modified by CYP 17 polymorphisms. In the past year, laboratory assays on CYP 17 polymorphisms are being conducted in the Division of Environmental Health Sciences of Columbia University. The polymorphisms are being determined by PCR-RFLP methods with a digestion by appropriate restriction enzymes. to date, assays on 300 cases and 300 controls have been performed. Delays in subject and sample selection in the parent LIBSCP study delayed Task 1, thus delaying the start of laboratory analyses. Therefore, Task 2 will not be completed until the end of September 1999. Entry of laboratory data to computers and merging of laboratory data with questionnaire data (Task 3) are estimated to begin in October 1999. Data analysis, manuscript preparation and report writing (Tasks 4 & 5) will take place in the coming year.
DTIC
Polymorphism; Cancer; Mammary Glands; Medical Science; Estrogens

20010020252 Cincinnati Univ., OH USA
Control of Carcinoma Cell Motility by E-Cadherin ***Annual Report, 1 Aug. 1998-31 Jul. 1999***
Brackenbury, Robert; Aug. 1999; 22p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-98-1-8292
Report No.(s): AD-A385384; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Tumor invasion is a major obstacle to effective clinical management of breast cancer. to identify new targets for anti-invasive therapies, we have focused on the mechanisms by which the cell adhesion molecule E-cadherin suppresses tumor invasion. We previously found that E-cadherin does not suppress invasion via its adhesive activity. We hypothesized instead that E-cadherin-mediated contact generates intracellular signal(s) that regulate cell movement. In the present work, we have identified pathways by which E-cadherin affects cell behavior. In one pathway, cell-cell adhesion mediated by E-cadherin allows binding between the receptor tyrosine kinase EphA2 and its ligands. This interaction results in tyrosine phosphorylation of EphA2, which inhibits proliferation and decreases focal adhesions. The second pathway is defined by preliminary evidence suggesting that E-cadherin induces tyrosine phosphorylation of unidentified cell components by an EphA2-independent mechanism.
DTIC
Proteins; Cancer; Mammary Glands; Receptors (Physiology); Medical Science

20010020253 Columbia Univ., New York, NY USA
Model and Expansion Based Methods of Detection of Small Masses in Radiographs of Dense Breasts ***Annual Report, 1 Jun 1999-31 May 2000***
Laine, Andrew F.; Jun. 2000; 39p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9154
Report No.(s): AD-A385385; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes progress made in during the first year of study. Our goal is to detect masses in dense mammograms having a diameter less than 1 cm. The 'idea' of this project is to detect subtle masses by tuning the central frequency and width of a basis function generating overcomplete expansions. By modeling the shape of a mass through this flexibility we hope to detect small and subtle masses in dense breasts and improve the chances of early detection in screening mammography. In the first part of our investigation, we first evaluated existing tools to compute overcomplete expansions of multiscale signals. We compared in one dimension the CwT and the DWT for a proof of concept concerning any advantage of pursuing refinement of scale. We processed phantom masses, and iD intensity profiles of real masses mammograms to evaluate feasibility. In order to identify the best scale, we evaluated the use of maxima singularities and a correlated model using three masses of different size. Our study answered the question of weather of not dyadic scales were sufficient to detect masses in a dense mammograms. We clearly showed that reasonable approximations of mass shapes could be obtained through overcomplete expansions that computed voices between the traditional dyadic scales.
DTIC
Cancer; Mammary Glands; Medical Science; Detection; Size (Dimensions)

20010020254 Columbia Univ., New York, NY USA
Characterization of a Novel Tumor Suppressor Gene, mda-7, and its Ability to Induce Apoptosis ***Annual Report, 1 Aug. 1998-31 Jul. 1999***
Madireddi, Malavi; Fisher, Paul; Aug. 1999; 18p; In English
Contract(s)/Grant(s): DAMD17-98-1-8053
Report No.(s): AD-A385389; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Information on targets for anticancer therapy that are most likely to lead to cancer cell death and/or cessation of growth is necessary. Human melanoma cells exhibit irreversible growth arrest and terminally differentiate on treatment with recombinant

human fibroblast intefferon-beta (IFN-beta) and a protein kinase C activator meserein (MEZ). to identify and characterize the milieu of gene expression alterations associated with growth arrest and differentiation we applied subtraction hybridization. One of the genes so identified is mda-7, a novel tumor cell specific, growth suppressor gene. Mda-7,gene expression is elevated in terminally differentiated human melanoma cells, however, ectopic expression of recombinant mda-7 initiates growth suppression and apoptosis. Interestingly this tumor growth suppression property of mda-7 is not limited to melanoma alone and is evident in diverse cancers of various origins and having different genetic alterations. Utilizing a replication deficient adenoviral vector, the tumor growth suppression/apoptosis induction property of mda-7 was studied with a view towards the development of a new experimental tumor gene therapeutic. When tested in vivo in nude mice, using both tumorigenesis and experimental gene therapy protocols, Ad.mda-7 S suppresses tumor growth and inhibits cancer progression. In contrast, no discernible biological effect is elicited by both normal human epithelial or fibroblast cells when infected with Ad.mda-7 S. The differential growth suppression activity of mda-7 towards cancer cells and its selective anti-tumor effects illustrate a novel class of cancer growth suppressor genes with great promise for targeted therapy of human cancers.
DTIC
Genes; Chemotherapy; Cancer; Apoptosis; Mammary Glands; Medical Science; Suppressors; Tumors

20010020255 Washington Univ., Grant and Contract Services, Seattle, WA USA
Preclinical Evaluation of a Targeted Alpha-Emitting Radionuclide in Radiotheraphy of Breast Cancer ***Annual Report, 15 Aug. 1998-14 Aug. 1999***
Wilbur, D. S.; Sep. 1999; 20p; In English
Contract(s)/Grant(s): DAMD17-98-1-8258
Report No.(s): AD-A385390; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research effort is directed at evaluation of the alpha-emitting radionuclide, Bi-2l3 targeted to a metastatic breast cancer model (subrenal capsules) in an antibody-targeted protocol called 'pretargeting'. In the studies, biotinylated anti-breast cancer antibody, huBrE-3 was to be used as a pretargeting agent. However, the antibody has not been provided to us (as previously promised). A substantial amount of work has been conducted to find an alternative antibody for use in the studies. The antibodies, L6 and NR-LU-lO are being evaluated as alternatives. Subrenal capsules of MCF-7 cells have been prepared, with a successful growth rate of 75%. The carrier for Bi-2l3 in the pretargeting protocols can be either modified streptavidin or a biotin-chelate derivative. Three biotin derivatives containing the CHX (DTPA) chelate and one containing the DOTA chelate were synthesized for the study. The biotin-DOTA derivative labeled too slowly for use with Bi-2l3. Streptavidin has been conjugated with the CHX-A chelate and succinylated to obtain low kidney concentrations.
DTIC
Clinical Medicine; Cancer; Radiation Therapy; Mammary Glands; Medical Science; Biotin

20010020256 Vanderbilt Univ., Nashville, TN USA
Genetic Analysis of a Mammalian Chromosomal Origin of Replication ***Annual Report, 1 Aug. 1999-31 Jul. 2000***
Altman, Amy L.; Fanning, Ellen; Aug. 2000; 65p; In English
Contract(s)/Grant(s): DAMD17-99-1-9420
Report No.(s): AD-A385392; DSTO-TR-0855; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The main goal of the research proposal was to develop an assay system for studying the specific genetic elements, if any, involved in the initiation of DNA replication in mammalian cells as outlined in Task 1. Since submission of the grant proposal, I have successfully developed a suitable assay for elucidating specific cis-acting elements involved in replication initiation. Briefly, a competitive polymerase chain reaction-based nascent strand abundance assay was used to demonstrate the ability of a small 5.7 kb fragment of DNA, containing the DHFR ori-beta initiation region, to support efficient origin activity when integrated into random ectopic positions in the hamster chromosome.
DTIC
Cancer; Mammary Glands; Genetics; Assaying; Medical Science

20010020273 Nevada Univ., Las Vegas, NV USA
Cell Migration as a Therapeutic Target in Malignant Breast Cancer ***Annual Report, 1 Sep. 1998-31 Aug. 1999***
Plopper, George E.; Sep. 1999; 20p; In English
Contract(s)/Grant(s): DAMD17-98-1-8325
Report No.(s): AD-A385355; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The object of this project is to develop a high-throughput method for screening potential inhibitors of breast cancer cell haptotaxis and chemotaxis, and to apply this method to identify signaling events mediating constitutive migration of malignant breast

cells. The pathways that control these signaling events may be targets for development of new classes of anti-tumor drugs. The significant advances made during the first year of this project include: (1) design and manufacture of the hardware necessary to develop the high- throughput screen, (2) development of an efficient, high-throughput migration assay compatible with drug screening, and (3) formation of a collaboration with the Developmental Therapeutics Program to screen their plated and natural products repositories for new inhibitors of breast cancer cell migration. Our mechanistic work has focused on construction of cell lines overexpressing normal and mutant forms of candidate signaling molecules involved in breast cell migration, including protein alpha subunits, focal adhesion kinase (FAK), and crk associated substrate (CAS). Our work in the second year will focus on screening compounds and characterizing these cell lines to find new inhibitors of migration and new targets for drug design, respectively.
DTIC
Mammary Glands; Cancer; Medical Science; Drugs; Inhibitors

20010020275 Maryland Univ., Baltimore, MD USA
Characterization of Breast Cancer Cell Death Induced by Interferons and Retinoids ***Final Report, 1 Jun. 1996-30 Jun. 00***
Kalvakolanu, Dhan; Hofmann, Edward; Jun. 2000; 51p; In English
Contract(s)/Grant(s): DAMD17-96-1-6146
Report No.(s): AD-A385358; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Apoptosis or programmed cell death (PCD) is a biological process used by metazoans to eliminate cells that are superfluous or potentially dangerous. PCD is vital to proper animal development as well as tissue homeostasis in adults. It has also been implicated as a mechanism for eliminating pathogen infected cells. Defective regulation of apoptosis has been implicated in various pathological conditions including cancer, autoimmune diseases 1, 2 stroke damage and neurodegenerative diseases 3-6. Loss of apoptosis may also result in drug resistance in tumor cells 7, 8. Apoptosis in mammals is influenced by a perplexing number of pathways induced by cytokines, survival factors, cell-cell and cell-ECM (extra-cellular matrix) interactions, oncogenes, DNA damage, and viral proteins 9-12.
DTIC
Cancer; Tissues (Biology); Cells (Biology); Mammary Glands; Apoptosis; Damage; Medical Science

20010020279 Strang Cancer Prevention Center, New York, NY USA
Statistical Analysis of Multivariate Interval-Censored Data in Breast Cancer Follow-Up Studies, ***1 Jul. 1999 - 30 Jun. 2000***
Wong, George; Jul. 2000; 8p; In English
Contract(s)/Grant(s): DAMD17-99-1-9990
Report No.(s): AD-A385363; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Interval-censored (IC) data are encountered in three areas of breast cancer research. The most common application is in clinical relapse follow-up studies in which the study endpoint is disease-free survival. When a patient relapses, it is usually known that the relapse takes place between two follow-up visits, and the exact time to relapse is unknown. In statistics, we say relapse time is interval censored. Interval censoring is also encountered in breast cancer registry studies in which information on family history of cancer is updated periodically. The Strang Breast Surveillance Program for women at increased risk for breast cancer, for instance, has enlisted over 800 women with complete pedigree information which is verified and updated continuously. Family history data such as age at diagnosis of a specific cancer, or a benign but risk-conferring condition, are obtained from each registrant at each update. Time to a cancer event, and definitely time to first detection of a benign condition, are at best known to fall in the time interval between the last update and age at diagnosis. A third but increasingly important area of application of interval censoring is in breast cancer chemoprevention experiments or prevention trials, which involve the observation of one or more surrogate endpoint biomarkers (SEB) over time. The scientific question of interest here is the estimation of time for the SEB to reach a target value, and time from cessation of intake of a chemopreventive agent to the loss of its protective effect. Unfortunately, the exact values of both these time variables are known only to lie in between two successive assay inspection times.
DTIC
Multivariate Statistical Analysis; Censored Data (Mathematics); Mammary Glands; Cancer

20010020280 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA

Role of the Novel Kinase, H51, in Breast Development, Differentiation, and Carcinogenesis ***Annual Report, 1 Jul. 1998-30 Jun. 1999***

Stairs, Douglas B.; Jul. 1999; 30p; In English; Original contains color plates

Contract(s)/Grant(s): DAMN DAMD17-98-1-8235

Report No.(s): AD-A385364; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Several protein kinases involved in mammary gland development have been associated with human breast cancer and murine animal models of mammary gland carcinogenesis. to identify other protein kinases expressed in the mammary gland which may be involved in these processes, an RT-PCR degenerate oligonucleotide screen was performed on several transformed mammary epithelial cell lines and tissue derived from the mammary gland during different developmental stages. Forty-one kinases were identified, of which three were novel. One of these novel kinases, Krct, does not belong to any previously described subfamily of kinases. Analysis of the expression of murine Krct, demonstrates Krct expression in all tissues analyzed during all stages of development. Despite this wide expression pattern, Krct expression is preferentially expressed in the epithelium of several tissues including the mammary gland. Since many kinases regulate cellular proliferation and differentiation, it will be important to determine Krct's role in these processes. An analysis of the expression pattern of Krct during proliferation and differentiation has been initiated. Preliminary results demonstrate Krct may be cell cycle regulated. Since many genes that regulate the cell cycle are themselves regulated, these results suggest that Krct may regulate proliferation. Further analysis of Krct with proliferation and differentiation assays in vitro and in vivo will determine if Krct is involved in these cellular processes.

DTIC

Cancer; Tissues (Biology); Cells (Biology); Mammary Glands; Medical Science

20010020289 Geospace Research, Inc., El Segundo, CA USA

A Knowledge-Based Diagnosis and Treatment Display Unit ***Final Report, 1 Jan 1998-31 May 2000***

Djuth, Frank T.; Elder, John H.; Johnston, Paula M.; Woodward, Paul P.; Hahn, Jackie A.; Aug. 19, 2000; 107p; In English; Prepared in cooperation with Loma Linda Univ. Medical Center, Loma Linda, CA.

Contract(s)/Grant(s): DAAG55-98-C-0002

Report No.(s): AD-A385745; GRI-ST-00-7430; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The objective of this project was to develop a high-performance diagnostic and treatment display unit that is optimized for a user equivalent to a physician's assistant. A key aspect of the system is the decision-making software which monitors the patient's physiological status and anticipates downturns in medical condition. Data from physiological sensors are combined with a knowledge base that includes treatments for penetrating and blunt trauma. The unit is optimized to monitor trauma victims that are not in need of immediate surgery at a Battalion Aid Station. This makes it possible to provide significantly improved medical care to wounded soldiers while reducing the number of attending medical personnel. The primary application in civilian medical care is in intensive care units. Here, patients are often hemodynamically stable but not hemodynamically normal. The diagnosis and treatment display software runs on a laptop computer and is linked to medical sensors via serial and PCMCIA ports. A variety of real-time displays are available during the patient monitoring period. These include displays of patient status, parsed and processed sensor data, and fully analyzed sensor values and trends. Sensor data are automatically checked by the analysis algorithm for validity, and commonly occurring artifacts are identified and eliminated.

DTIC

Diagnosis; Display Devices; Decision Making; Real Time Operation

20010020292 Wisconsin Univ., Madison, WI USA

Investigating the Role of Cooperative Interactions Between the Neu Proto-oncogene and the Other erbB Family Members in Rat Mammary Carcinogenesis ***Final Report, 1 Jul. 1996-30 Jun. 2000***

Gould, Michael N.; Watson, Philip; Jul. 2000; 19p; In English

Contract(s)/Grant(s): DAMD17-96-1-6263

Report No.(s): AD-A385750; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In order to generate a rat model of neu-induced mammary carcinogenesis, we have created transgenic rats that utilize the mouse mammary tumor virus promoter to overexpress the rat neu proto-oncogene in the mammary gland. A nuclease protection assay was used to quantify the relative overexpression of neu message within the mammary gland and rats of both sexes were observed until at least 14 months of age. In the most characterized line (line 6500), transgenic virgin females and males at 12 weeks of age overexpressed neu in the mammary gland. The expression level of neu was equal between the two sexes. Despite this neu overexpression, mammary carcinomas did not develop in any of the transgenic virgin females at 14 months or 18 months. In striking contrast to the females, 77.8% and 100% of the transgenic males developed mammary carcinomas at 14 and 18 months of

age, respectively. Sequence analysis from 13 of the mammary carcinomas revealed that the neu transgene had not undergone any spontaneous mutations in the transmembrane domain and adjacent extracellular domain, regions which have been reported to be mutated in neu transgenic mice. To assess the role of hormones in the observed mammary carcinogenesis, both male and females were gonadectomized at 8 weeks of age and sacrificed at 14 months of age. Mammary carcinomas did not develop in any of the castrated transgenic males while 100% of the intact transgenic males developed multiple mammary carcinomas. Transgenic females did not develop mammary carcinomas regardless of gonadal status. These results suggest that in the context of HER2/neu overexpression, androgens may be powerful promoters of mammary carcinogenesis.
DTIC
Carcinogens; Mammary Glands; Rats

20010020293 Rutgers - The State Univ., Piscataway, NJ USA
Cell Cycle Regulation by TGFb Signaling in C. elegans ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Padgett, Richard; Jul. 2000; 38p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9365
Report No.(s): AD-A385751; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One of the most potent inhibitors of epithelial cell growth is TGFbeta. Understanding the connection between TGFbeta and cell cycle control is an important avenue of experimentation towards treating breast cancers. We are utilizing two complementary approaches in C. elegans to find cell cycle regulatory genes that respond to TGFbeta signaling. First, in genetic screens using a cell cycle reporter gene, ribonucleotide reductase, we are looking for mutations in genes that release dauer animals (a TGFbeta induced developmental stage) from their cell cycle arrest. Secondly, we are using DNA microarrays probed with RNA from arrested animals and from animals released by TGFbeta to identify genes that are transcribed differentially. to carry out these experiments, we have constructed a new reporter gene for use in our genetic screen, and have worked out conditions to synchronize and harvest sufficient quantities of animals for making mRNA for the microarray experiments. During the next year, we will be identifying genes that are candidates for regulatory control by TGFbeta, which will offer insights into how TGFbeta control this aspect of the cell cycle.
DTIC
Cell Division; Mammary Glands; Deoxyribonucleic Acid; Cancer; Genetics

20010020294 Thomas Jefferson Univ., Philadelphia, PA USA
Antibody Directed Gene Therapy for Breast Cancer ***Annual Report, 1 Jun 1998-31 May 1999***
Jun. 1999; 12p; In English
Contract(s)/Grant(s): DAMD17-97-1-7047
Report No.(s): AD-A385754; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Gene therapy offers an exciting new approach to treating cancer, in particular by introducing cytokine genes into tumor cells, which has been extensively studied in animal models. Ideally it would be desirable to have a reagent that could be injected into the patient and would target tumor cells. The main objective of this proposal is to develop monoclonal antibodies as cell specific targeting vectors so that they are able to bind and carry DNA into cells. The molecularly engineered antibody targeted DNA to tumor cells, but the expression of the DNA was low. Different strategies are being examined to improve the expression. The condensation of DNA has been shown to be important to efficient DNA uptake. A detailed study of conditions to achieve DNA condensation under physiological salt concentration was performed. Though DNA condensation was achieved, it did not result in an improvement. The entire domain containing the influenza hemagglutinin fusion peptide has been engineered to bind DNA in order to facilitate DNA entry into the cytoplasm. Two different strategies are being pursued to overcome the nuclear membrane barrier.
DTIC
Cancer; Genes; Therapy; Mammary Glands; Cells (Biology)

20010020295 Yale Univ., New Haven, CT USA
Muscle and Liver Carbohydrates: Response to Military Task Performance by Women & Men ***Annual Report, 23 Sep. 1998-22 Sep. 1999***
Price, Thomas; Oct. 1999; 39p; In English
Contract(s)/Grant(s): DAMD17-96-C-6097
Report No.(s): AD-A385756; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the third year we have focused on making significant progress in both the MRI and the MRS portions of this project. We have been hampered by difficulty in recruiting suitable subjects and by difficulty in getting female subjects to return for a

second MRS study. Nevertheless we have confirmed that 1) Women recruit their upper bodies more than men, and 2) Quadriceps glycogen is nominally depleted by our protocol in both genders. We are now able to consider several additional preliminary conclusions. 1) As prolonged exercise continues muscle recruitment patterns do not change. 2) The left biceps muscle is more heavily recruited in women (MRI) and this results in faster glycogen depletion rates (MRS) in women than in men. 3) Net liver glycogen depletion rates during exercise are slower in women in the luteal phase of their menstrual cycle than in men or in women in the follicular phase. This suggests that hormonal fluxes exert an effect under our experimental conditions. We have begun a second MRS study on the effect of four consecutive days of our protocol and early data suggest that in both genders exercised muscles progressively supercompensate glycogen. The major failure of this current project is the paucity of suitable subjects that has resulted in our low numbers of completed studies to date. We are considering increasing subject compensation, and we intend to continue the project beyond term in order to confirm or refute our conclusions thus far.
DTIC
Muscular Function; Physical Exercise; Liver; Human Performance; Muscles

20010020297 Vermont Univ., Burlington, VT USA
Identification of Small Ligands Targeting Breast Cancer by In Vivo Screening of Peptide Libraries in Breast Cancer Patients ***Annual Report, 5 Aug. 1999-4 Aug. 2000***
Krag, David N.; Sep. 2000; 308p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9425
Report No.(s): AD-A385787; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The ultimate goal of the project described in the present report is to perform in vivo screening experiments of phage-displayed random peptides libraries (RPLs) in human breast cancer patients, in order to identify peptides that will home specifically to their tumor tissue. In future work, these breast tumor-homing peptides will be used to develop novel breast cancer therapeutics. The work described in this annual report includes: 1) Construction of five new RPLs. 2) Toxicity testing of intravenous injection of peptide-phage in animals, which is detailed in an enclosed IND application. The IND needs only minor additions for approval by the FDA. 3) Several in vivo screening experiments in mice with tumors. The in vivo screening experiments we have performed in mice, with essentially the same protocol proposed for human screening, as well as other toxicity testing experiments, provide evidence that in vivo screening with phage-displayed RPLs is safe. In addition, the in vivo screenings have identified several consensus amino acid sequences. An especially exciting result is that some of the peptides we have identified by in vivo screening are strikingly similar to peptides described by others as specific inhibitors of matrix metalloproteinases 2 and 9, which are promising tumor targets.
DTIC
Cancer; Ligands; Mammary Glands; Patients; Peptides; In Vivo Methods and Tests

20010020298 Baylor Coll. of Medicine, Houston, TX USA
The Role of Orphan Nuclear Receptor COUP-TPII in Prostate Development and Tumorigenesis ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Zhou, Ge; Jul. 2000; 17p; In English
Contract(s)/Grant(s): DAMD17-99-1-9509
Report No.(s): AD-A385603; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Orphan nuclear receptor COUP-TEll plays important roles in controlling diverse aspects of cell growth, development, differentiation and homeostasis. During the development, its expression is spatially and temporally restricted within mesenchymal cells of many organs (including developing prostate glands) that require interactions between the mesenchymal and epithelial compartments for proper development. The timing and expression pattern of COUP-TEll in prostate are closely correlated with the development and differentiation of the prostate glands, suggesting that COUP-TEll is an important modulator for mesenchymal-epithelial interactions required for the normal prostate development and tumorigenesis of prostate cancer. to study COUP-TEll's function during the development of prostate gland and the carcinogenesis of prostate cancer, we have successfully generated adenoviral vectors that effectively express sense and antisense COUP-TEll mRNA. More effort is being devoted to analyze the effect of COUP-TEll over-or under-expression on the ability of mesenchyme to induce epithelial differentiation, and the ability of tumorigenesis of prostate cancer cell lines. In addition, we established rUGM cell lines which over-and under-express COUP-TEll. The effect of changing the level of COUP-TEll expression in rUGM cells on the modulation of tumor growth induced by epithelial cells in asthymic nude mice will be studied.
DTIC
Cells (Biology); Prostate Gland; Tumors; Receptors (Physiology); Carcinogens; Gene Expression

20010020301 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA

Mammary Specific Expression of Cre Recombinase Under the Control of an Endogenous MMTV LTR: A Conditional Knock-Out System ***Annual Report***

Czarneski, Jennifer; Apr. 2000; 8p; In English

Contract(s)/Grant(s): DAMD17-99-1-8233

Report No.(s): AD-A385587; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The proposed project was to test the expression of Cre recombinase directed by the Mtv-17 locus is in its second of three years of funding. The hypothesis of the project was to develop a novel breast cancer model using the tissue-specific expression of the Mtv-17 locus, which was previously shown by this lab to only be expressed in the mammary gland. We proposed knocking-in the Cre recombinase gene at the Mtv-17 env region, so that this enzyme would only be expressed in the mammary gland. Mice that carried the Mtv-17 Cre fusion vector would then be mated to mice that had the p53 locus flanked by loxP sites, resulting in the tissue-specific loss of p53 in the mammary gland only. The prediction is that these animals would only develop mammary and not other tumors. We believed that the cre-transgenic mice would also prove useful for other investigators in the mammary gland development and tumorigenesis field.

DTIC

Mammary Glands; Gene Expression; Cancer

20010020305 Temple Univ., School of Medicine, Philadelphia, PA USA

Tropomyosim-1: A Putative Tumor Suppressor and a Biomarker of Human Breast Cancer ***Annual Report, 27 Jul. 1998-26 Jul. 1999***

Prasad, Gaddamanugu L.; Aug. 1999; 35p; In English

Contract(s)/Grant(s): DAMD17-98-1-8162

Report No.(s): AD-A385563; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of our research is to elucidate the role of a novel class II tumor suppressor, tropomyosin-1 (TM1) in breast cancer. Under the four technical objectives, we have initiated work on whether TMl expression is altered during malignant transformation of mammary epithelium, and if those changes are causally linked to breast cancer. Expression of TM1 was assessed in normal and malignant breast epithelium. A novel TM-1-specific antibody was developed, and with this reagent, by immunohistochemistry, we found that normal breast epithelium expressed TM1, while the cancerous tissue lacked TMl expression (Objective 1). MCF-7 cells, which lost TMl expression, were transduced to re-express TM1; restoration of TM 1 expression results in altered morphology and in decreased growth rates. Both parental MCF-7 and the transduced clones remain sensitive to estrogen. Most significantly, expression of TMl completely abolishes the growth of MCF-7 cells in soft agar. This demonstrates that TMl abolishes the malignant phenotype MCF-7 cells and reverts them to normal phenotype. Therefore, loss of TMl expression is a critical change during mammary carcinogenesis (Objective 2). Antisense experiments (Objective 3) and construction of chimeric TMs (Objective 4) are now in progress.

DTIC

Cancer; Epithelium; Mammary Glands; Suppressors; Neoplasms

20010020306 Sloan-Kettering Inst. for Cancer Research, New York, NY USA

Synthesis of Epothilone Analogs: Toward the Development of Potent Anticancer Drugs ***Annual Report, 1 Aug. 1998-31 Jul. 1999***

Lee, Chul B.; Danishefshsky, Samuel J.; Aug. 1999; 10p; In English

Contract(s)/Grant(s): DAMD17-98-1-8155

Report No.(s): AD-A385561; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The epothilones are naturally occurring cytotoxic molecules that possess a remarkable ability to arrest cell division through the stabilization of microtuble assemblies. The in vitro and in vivo studies with desoxyepothilone B (dEpoB) have established that the desoxy compound is well tolerated and virtually curative against a variety of sensitive and resistant xenograft tumors in animal models. In light of these discoveries, a new analogue, 2l-hydroxy-12,13-desoxyepothilone B (dEpoF), has been designed and synthesized. The preliminary biological studies suggest that the new analogue is highly potent against various tumor cell lines and may have an advantage over dEpoB due to the presence of an extra hydroxy group. A chemical synthesis of dEPoF that would be able to support a serious and substantial discovery research program directed toward the clinical development is in active progress.

DTIC

Cell Division; Drugs; Clinical Medicine; Cancer

20010020340 Pennsylvania Univ., Wistar Inst., Philadelphia, PA USA

Bin1, Apoptosis, and Prostate Cancer ***Annual Report, 1 Aug. 1998-31 Jul. 1999***

Rauscher, Frank J.; Aug. 1999; 125p; In English

Contract(s)/Grant(s): DAMD17-98-1-8508

Report No.(s): AD-A385677; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The genetic causes of prostate cancer remain largely unknown. One of the most common chromosomal abnormalities seen in tumors which have acquired invasive and metastatic potential is gain of chromosome 8q, where c-Myc is located. Gains of 8q of are well-correlated with disease progression insofar as they are found in 85% of lymph node metastases and 89% of recurrent hormone refractive tumors. C-Myc amplification or overexpression is found in many prostate tumors and is a likely progression marker. Oncogenic activation of c-Myc by gene amplification delivers a powerful signal that is sufficient to drive cell cycle progression and malignant growth in many types of cells, including prostate cells. However, in premalignant cells, c-Myc can also activate apoptosis such that its oncogenic activation is balanced by apoptotic penalty. Therefore, malignant cells may escape this penalty by inactivating tumor suppressor functions. p53 is an important player but is likely irrelevant to this process in prostate cells because inactivation of p53 does not compromise c-Myc-mediated apoptosis in epithelial cells. Thus, loss or inactivation of molecules other than p53 should be considered.

DTIC

Apoptosis; Cancer; Prostate Gland; Genetics; Tissues (Biology)

20010020341 Chicago Univ., Chicago, IL USA

Advanced Methods for the Computer-Aided Diagnosis of Lesions in Digital Mammograms ***Annual Report, 7 Jun. 1998-6 Jun. 1999***

Giger, Maryellen L.; Jul. 1999; 34p; In English

Contract(s)/Grant(s): DAMD17-96-1-6058

Report No.(s): AD-A385676; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objective of the proposed research is to develop computer-aided diagnosis methods for use in mammography in order to increase the diagnostic accuracy of radiologists and to aid in mammographic screening programs. We have increased the detection accuracy of our computerized method by incorporating temporal information and by developing a new single-image detection method. We have also investigated methods for feature selection and feature merging (classifiers) when only limited datasets are available. We have also continued to implement and investigate the use of out clinical prototype intelligent workstation.

DTIC

Clinical Medicine; Diagnosis; Lesions; Computer Techniques; Mammary Glands; Digital Systems

20010020342 Howard Univ., Washington, DC USA

High Temperature Superconductor RF Probes for Breast Cancer Research ***Annual Report, 20 Sep. 1998-19 Sep. 1999***

Wang, Paul C.; Oct. 1999; 20p; In English

Contract(s)/Grant(s): DAMD17-96-1-6289

Report No.(s): AD-A385675; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the third year, we have procured specialized cryo-valves, low-temperature components and Oxford cryostat. All these components are assembled with the High Temperature Superconductor (HTS) coil. The complete HTS probe is under final evaluation. We have concentrated on in vivo Nuclear Magnetic Resonance (NMR) spectroscopy and micro-imaging studies of MCF7 wild type and MCF7/ADR drug resistant tumors. A localized NMR spectroscopy technique ISIS (image-selected in vivo spectroscopy) was implemented. Detailed in vivo P-31 spectra were obtained. Many phosphate metabolites are identified and they are similar to the in vitro results. During tumor progression, the phosphocreatine and adenosine triphosphate gradually decrease while the inorganic phosphate increases. The control signals of non-involved muscle show constant intensities. The phosphomonoester and phosphodiester signals are too weak for an accurate measurement. For the microscopic imaging of mouse, it demonstrated many small capillaries. The image resolution of 30 micrometers is accomplished.

DTIC

Cancer; High Temperature Superconductors; Mammary Glands; Radio Frequencies; Drugs; In Vivo Methods and Tests

20010020343 California Univ., Davis, CA USA

Functional Detection of p53 Mutations in Archival Prostate Cancer Tissue ***Annual Report, 1 Sep. 1998-31 Aug. 1999***

Evans, Christopher; Sep. 1999; 12p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-98-1-8568

Report No.(s): AD-A385674; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The subject of this research is 'Functional Detection of p53 Mutations in Archival Prostate Cancer Tissue'. The first aim of this research is to develop a yeast functional assay for the detection of individual p53 mutations in paraffin-embedded archival prostate cancer (CaP) tissues. The second aim is to determine the functional status of individual p53 mutations found in CaP. Although IHC and SSCP are commonly used to detect p53 mutations, their frequency is often overestimated by the former and underestimated by the latter techniques. In the first year, we have completed the evaluation of the application of this method. This includes optimizing the conditions for PCR and yeast transformation, measuring the background levels of the yeast functional assay of genomic p53 DNA, and comparing the yeast functional assay to the SSCP analysis of exon 5 of the p53 gene. Because the function of mutant p53 genes are so important to tumorigenesis and progression of cancer, these results will help in understanding the biological function of individual p53 mutations in CaP.
DTIC
Cancer; Mutations; Prostate Gland; Tissues (Biology); Genetics; Molecular Biology

20010020346 Dartmouth Coll., Hanover, NH USA
Androgen and Vitamin D Receptor Gene Polymorphisms and Breast Cancer Risk ***Annual Report***
Baron, John A.; Oct. 1999; 8p; In English
Contract(s)/Grant(s): DAMD17-98-1-8301
Report No.(s): AD-A385662; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This project will assess the association between the risk of breast cancer and polymorphisms of the androgen and vitamin D receptor among subjects in a recently- completed population-based case-control study in Sweden. A total of 3879 cases and 3527 controls took part, providing questionnaire data regarding use of exogenous hormones and other life style factors. From this study population, 1800 cases and 1800 controls will be randomly selected for genomic DNA analysis. The collection of blood or tissue specimens for DNA has been funded from other sources; this award is for the measurement of the AR and VDR on 300 cases and 300 controls who never used HRT, and 300 cases and 300 controls who used HRT for 4 years or more. Information on these polymorphisms will be incorporated into the established subject database, and odds ratios summarizing the associations with breast cancer risk will be computed. In the first year of the project, the administrative arrangements for the work were established, and a tracking database for subject recruitment and specimen accrual built. Recruitment into the molecular epidemiology study is proceeding well, and the anticipated laboratory analyses will begin shortly.
DTIC
Polymorphism; Mammary Glands; Cancer

20010020347 Michigan Univ., Ann Arbor, MI USA
Stress and Coping in Genetic Testing for Cancer Risk ***Annual Report, 15 Jun. 1999-14 Jun. 00***
Sonis, Jeffrey; Jul. 2000; 324p; In English
Contract(s)/Grant(s): DAMD17-96-1-6157
Report No.(s): AD-A385661; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
This project is a prospective study of women who are at high risk for early-onset breast cancer, and their husbands and siblings. Proband women are assessed at entry into the study, immediately before receiving results, and 2 months, 6 months, and 12 months after receiving results. Among women who do not receive test results, yearly assessments are administered to track changes in functioning over time. The main objectives of the study have been to describe psychological functioning among high-risk women and their families; to evaluate the performance of screening instruments in detecting clinical depression; to describe social support processes among high-risk women; and as follow-up data become available, to assess the impact of genetic testing on women and their families. In general, both extensive baseline data and preliminary follow-up data suggest that women and their families manage the process of genetic testing well, exhibiting relatively low levels of distress and worry, and reporting few negative effects of testing. Ongoing analyses are beginning to clarify predictors of health behaviors, risk perception, response to testing, marital functioning, and other indicators of adjustment. Future analyses will clarify causal relationships among personality, functioning, and other variables, as follow-up data become available.
DTIC
Genetics; Genes; Mammary Glands; Cancer

20010020348 Battelle Memorial Inst., Seattle, WA USA

An Investigation of Reproductive Health Outcomes and Potential Risk Factors in Air Force Women ***Annual Report, 1 Oct. 1998-30 Sep. 1999***

Echeverria, Diana; Oct. 1999; 383p; In English

Contract(s)/Grant(s): DAMD17-96-C-6103

Report No.(s): AD-A385660; No Copyright; Avail: CASI; A17, Hardcopy; A03, Microfiche

Reproductive health outcomes and their potential risk factors have not been previously studied among Active Duty Air Force (ADAF) women. Phase I describes natality and adverse pregnancy outcome rates among women over a 20-year period (1975-1994) by age, race, rank, occupation, marital status, pay grade, geographic region, and Air Force Command. Accurate natality and adverse reproductive outcome rates indicate where improved health care planning are needed. The results provide a framework within which to interpret the reproductive consequences of future Air Force deployments. Phase II case-control studies evaluate ADAF women from 1990-1998. Causal hypotheses evaluate possible effects of occupational exposures and operational factors on risks of preterm delivery, pregnancy induced hypertension, and spontaneous abortion. The proposed cases (n=1875) and controls (n=1875) are ascertained using the Air Force Medical Support Agency (AFMSA) Standard Inpatient Record. Cases are matched with controls who are selected randomly within 2 months of conception and the Air Force Base assignment. Exposure data recorded prior to pregnancy eliminates potential recall bias. The results provide: (1) descriptions of natality and adverse reproductive outcome rates from 1975-1994; (2) projected rates stratified by AF Command and geographic region; and (3) two case-control studies examining the etiology of adverse outcomes.

DTIC

Pregnancy; Birth; Reproduction (Biology); Reproductive Systems; Medical Services; Females; Health

20010020349 Pittsburgh Univ., Pittsburgh, PA USA

Global Grid Telemedicine System: Expert Consult Manager ***Annual Report, 1 Oct. 1999-30 Sep. 2000***

May, Jerrold H.; Oct. 2000; 462p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-99-1-9581

Report No.(s): AD-A385659; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

The Artificial Intelligence in Management (AIM) Laboratory of the Katz School of Business, University of Pittsburgh will employ AIM Lab personnel and consultants to design, develop and test a prototype of the following U.S. Army Medical Research and Materiel Command (USAMRMC), Telemedicine and Advanced Technology Research Center (TATRC), Knowledge Engineering Group (KEG) Artificial Intelligence Research and Development efforts: Task 1: Design, Development and Prototyping The Expert Consult Broker of GGTS The AIM Lab will employ a combination of cognitive science, computer science, artificial intelligence, and management science methodologies to perform the task. The Principal Investigator will ensure that each task is analyzed and broken down into individual components which will be then further analyzed for specificity and applicability. Once this is accomplished, the principal investigator will apply current and state-of-the-art processes to improve each component. Once accomplished, the task will be reengineered in an iterative fashion.

DTIC

Artificial Intelligence; Expert Systems; Knowledge Representation; Knowledge Bases (Artificial Intelligence); Knowledge Based Systems

20010020351 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA

MRI-Based Screen for Breast Cancer Patients Carrying a Breast Cancer Susceptibility Gene ***Annual Report, 15 Sep. 1998-14 Sep. 1999***

Schnall, Mitchell D.; Oct. 1999; 10p; In English

Contract(s)/Grant(s): DAMD17-96-C-6059

Report No.(s): AD-A385654; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

To date, breast MRI screening studies have been performed in 165 women. These examination prompted breast biopsy in 15 women, 4 of which yielded malignancy. Results to date demonstrate the feasibility of using breast MRI to screen high risk women. In particular, adherence to strict architectural interpretation criteria has minimized false positive findings. Additional data is required before any statements of the potential efficacy of MRI can be made. This work has been critical to the development of a multi-center pilot trial of breast MRI screening in high risk populations.

DTIC

Magnetic Resonance; Imaging Techniques; Mammary Glands; Cancer

20010020352 California Univ., Los Angeles, CA USA
Suppression of Vascular Growth in Breast Cancer ***Final Report***
Iruela-Arispe, Luisa; Oct. 1999; 17p; In English
Contract(s)/Grant(s): DAMD17-94-J-4346
Report No.(s): AD-A385653; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Thrombospondin-1 is an extracellular matrix protein that has been shown to modulate the response of endothelial cells to growth factors. Specifically the protein suppresses endothelial cell proliferation, migration and angiogenesis in vivo. This grant allowed us to ascertain the significance of thrombospondin for the suppression of the vasculature in mammary tumors. Utilizing null and TSP-1 over-expressing mice, we determined that the protein plays a major role in the size, architecture, and number of vessels in mammary tumors.
DTIC
Cardiovascular System; Mammary Glands; Cancer

20010020353 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA
Long Interspersed Nuclear Element (LINE) Mediated Genomic Instability ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Nagarajan, Lalitha; Jul. 2000; 16p; In English
Contract(s)/Grant(s): DAMD17-99-1-9267
Report No.(s): AD-A385641; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We have isolated and characterized a novel human homeobox gene designated Mix. I homeobox (Xenopus laevis)-like gene 2 (MIXL2), as a gene that contains a repetitive element in its 3'UTR (MER22). The MMIXL2 gene encodes a predicted 202 amino acid open reading frame, which contains a highly conserved mix.1-like homeobox and an acidic motif. Radiation hybrid mapping and fluorescence in situ hybridization localize the MIXL2 gene to human chromosome Iq32-41, a region of gain in breast tumors.
DTIC
Mammary Glands; Genes

20010020354 Louisville Univ., KY USA
Procathepsin D Stimulation of Human Breast Cancer Cell Growth ***Annual Report, 15 Jun. 1999 - 14 Jun. 2000***
Vetvicka, Vaclav; Jul. 2000; 21p; In English
Contract(s)/Grant(s): DAMD17-99-1-9257
Report No.(s): AD-A385640; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The long-term objective is to develop a new treatment for breast cancer based on blockade of the growth factor activity of procathepsin D. Breast cancer cells secrete procathepsin D, the enzymatically inactive form from which the aspartic proteinase cathepsin D is generated by removal of an activation peptide (APpCD). Procathepsin D has been identified as an independent prognostic factor in several forms of cancer. In preliminary experiments, procathepsin D was found to act as a specific autocrine growth factor for breast cancer-derived cells, but not for any other cell type tested. First sets of MDA-MD-231 cell line transfected with procathepsin D cDNA are currently tested. Preliminary results showed high level of procathepsin D secreation and thus suggested successful transfection. Experiments establishing the basic values in invasiveness of parental cell line and the effect of procathepsin D have been established. Similarly, the effect of inhibition of procathepsin D secretion in vivo has been demonstrated. All necessary synthetic peptides and fragments were synthesized. After establishing that the fragment 27-44 is the part of the activation peptide responsible for the binding to the cancer cells, we focused out attention on this particular part of the activation peptide. We prepared the library of 10 peptides which will be tested in vitro. The goal is to pinpoint the exact binding moiety on the activation peptide molecule.
DTIC
Mammary Glands; Cancer; Stimulation; Cell Division

20010020360 Ohio State Univ., Research Foundation, Columbus, OH USA
Development of an erbB Antagonist ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Simcox, Amanda; Jul. 2000; 13p; In English
Contract(s)/Grant(s): DAMD17-99-1-9340
Report No.(s): AD-A385780; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Receptor tyrosine kinases of the erbB family play pivotal roles in growth and differentiation and aberrant activation of these receptors is associated with human cancers. In particular, ErbB-2 dysfunction has been linked to about 30% of breast cancers with poor prognosis. Correspondingly, great efforts are being made to develop therapies that target ErbB pathways. ErbB-2 is activated by the neuregulins in heterodimers with the neuregulin receptors ErbB-3 and ErbB-4. An antagonistic neuregulin that down regu-

lates ErbB signaling could function as an anti-tumor agent with significant clinical potential. The purpose here is to develop such a factor. In previous work, the Drosophila system was used to demonstrate that an antagonistic neuregulin-like factor could be made by deleting the EGF domain or by insertion of the EGF domain from a natural inhibitor. In this project, a vertebrate neuregulin with an EGF domain deletion and a factor with the EGF domain from the inhibitor were made and appear to have inhibitory activity in vitro. The activity of the factors is now being tested against human breast-cancer cell lines. Corresponding constructs have been made to generate transgenic mice and these will provide an in vivo test of the factors.
DTIC
Cancer; Mammary Glands; Genetics; Tyrosine; Prognosis; Inhibitors; Abnormalities

20010020367 Temple Univ., School of Medicine, Philadelphia, PA USA
Role of STAT-3 in ER- Breast Tumors ***Annual Report, 27 Jul. 1998-26 Jul. 1999***
Reddy, Premkumar; Aug. 1999; 8p; In English
Contract(s)/Grant(s): DAMD17-99-1-8163
Report No.(s): AD-A385453; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The hypothesis to be tested in this application is whether c-myb and A-myb genes regulate ductal cell proliferation and whether abnormalities in the expression of these genes results in breast cancer. During the first year of this study, we constructed targeting vectors that can be used for the deletion of exons 6 and 9 of mouse A-myb and c-myb genes. These vectors were transfected into embryonic stem cells and G418 resistant clones were screened for homologous recombination. Following selection, the cell lines were subjected to transient Cre expression and selection for ganciclovir-resistant clones. The ES cell clones that have undergone homologous recombination with our targeting vectors were injected into blastocysts to generate chimeric mice. to validate the results obtained from the mouse models in the human system, we have conducted parallel studies with human breast tumor cell lines. Analysis of human breast tumor cell lines showed that c-myb is expressed in a majority of ER+ human breast carcinomas, while A-myb expression is seen predominantly in ER- cell lines. Our results also shows that blockage of the biochemical function of c-myb results in a complete block to ER+ breast tumor cell proliferation.
DTIC
Cancer; Mammary Glands; Abnormalities; Cells (Biology); Genes

20010020399 Ohio State Univ., Dept. of Electrical Engineering, Columbus, OH USA
Wavelet Compression of Satellite-Transmitted Digital Mammograms ***Final Report, 1 Apr. 1999 - 31 Mar. 2000***
Zheng, Yuan F., Ohio State Univ., USA; [2001]; 31p; In English
Contract(s)/Grant(s): NAG3-2256; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Breast cancer is one of the major causes of cancer death in women in the USA. The most effective way to treat breast cancer is to detect it at an early stage by screening patients periodically. Conventional film-screening mammography uses X-ray films which are effective in detecting early abnormalities of the breast. Direct digital mammography has the potential to improve the image quality and to take advantages of convenient storage, efficient transmission, and powerful computer-aided diagnosis, etc. One effective alternative to direct digital imaging is secondary digitization of X-ray films. This technique may not provide as high an image quality as the direct digital approach, but definitely have other advantages inherent to digital images. One of them is the usage of satellite-transmission technique for transferring digital mammograms between a remote image-acquisition site and a central image-reading site. This technique can benefit a large population of women who reside in remote areas where major screening and diagnosing facilities are not available. The NASA-Lewis Research Center (LeRC), in collaboration with the Cleveland Clinic Foundation (CCF), has begun a pilot study to investigate the application of the Advanced Communications Technology Satellite (ACTS) network to telemammography. The bandwidth of the T1 transmission is limited (1.544 Mbps) while the size of a mammographic image is huge. It takes a long time to transmit a single mammogram. For example, a mammogram of 4k by 4k pixels with 16 bits per pixel needs more than 4 minutes to transmit. Four images for a typical screening exam would take more than 16 minutes. This is too long a time period for a convenient screening. Consequently, compression is necessary for making satellite-transmission of mammographic images practically possible. The Wavelet Research Group of the Department of Electrical Engineering at The Ohio State University (OSU) participated in the LeRC-CCF collaboration by providing advanced compression technology using wavelet transform. OSU developed a time-efficient software package with various wavelets to compress a serious of mammographic images. This documents reports the result of the compression activities.
Derived from text
Mammary Glands; Cancer; Wavelet Analysis; Image Processing; Females

20010020420 Texas A&M Univ., Health Science Center, College Station, TX USA
Molecular Genetic Approaches to Biomolecular Materials ***Final Report, 1 Jun. 1997 - 31 May 2000***
Bayley, Hagan; Nov. 15, 2000; 5p; In English
Contract(s)/Grant(s): DAAG55-97-1-0173
Report No.(s): AD-A385752; ARO-36953.1-LS-AAS; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The leukocidins are bicomponent pore-forming toxins that are structurally related to staphylococcal alpha-hemolysin, a single component toxin. alpha-Hemolysin has many applications in the area of biomolecular materials. Therefore, leukocidins have now been characterized to expand the set of tools available for materials engineering. The approach taken in the AASERT project was to obtain genes for the two components of the toxin, to express them in E. coli, to characterize the heterologously expressed pores by bilayer recording, and to use molecular genetic technology to explore structure- function relationships in these proteins. The first three of the four objectives have been accomplished.
DTIC
Toxins and Antitoxins; Genetics; Genes; Escherichia

20010020421 University of South Florida, Tampa, FL USA
Advanced Cancer Detection Center ***Annual Report, 1 Oct. 1998-30 Sep. 1999***
Ruckdeschel, John; Oct. 1999; 77p; In English
Contract(s)/Grant(s): DAMD17-98-1-8659
Report No.(s): AD-A385767; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The goals of the Advanced Cancer Detection Center of the H. Lee Moffitt Cancer Center & Research Institute at the University of South Florida include the discovery of molecular and genetic markers of cancer risk, the identification of individuals at high risk for cancer through screening, and the testing of methods to prevent cancer. In addition, the Center created and supports education programs to provide increased cancer awareness and established working collaborations with the James A. Haley VA Medical Center, the Bay Pines VA Medical Center, and the MacDill Air Force Base Hospital. The projects included in this report are: (1) Markers of Transformation in Airways Epithelial Cells from a Cohort of Obstructed Smokers and Former Smokers (PI: Tockman); (2) Breast Cancer Early Detection Study: Feasibility of Detecting and Characterizing Molecular and Antigenic Markers in Fluid from Breast Nipple Aspirate (PI: Shaw); (3) Genetic Analysis of Familial Prostate Cancer (PI:Sutphen); (4) The Specific Role of Genistein in Reducing Hormonal and Proliferative Risk Parameters in Prostate Cancer (PI: Kumar); (5) Specific Role of Genistein and Breast Cancer Risk (PI: Kumar); (6) Phase IlA Chemoprevention Study of Selenium in Persons at Risk for Lung Cancer (PI: Shaw); and (7) Development of the Moffitt Cancer Network as a Telemedicine and Teleconferencing Educational Tool for Health Care Providers (PI: Krischer). Each of these projects is presented as a complete study in the attached materials.
DTIC
Cancer; Medical Services; Health; Detection

20010020425 Burnham Inst., La Jolla, CA USA
DNA Methylation Alterations in Breast Cancer ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Yamamoto, Fumiichiro; Jul. 2000; 37p; In English
Contract(s)/Grant(s): DAMD17-99-1-9095
Report No.(s): AD-A385623; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We proposed to investigate breast cancer-associated DNA methylation alterations using a technique named Methylation Sensitive Restriction Fragment Length Polymorphism (MS-AFLP) which we developed. We performed NotI-MseI MS-AFLP using clinical specimens of normal and tumor breast DNA. We used both combinations of four NotI and four MseI primers with an additional selective residue at the 3' end (4x4 format) and combinations of four NotI with one additional residue and sixteen MseI with two additional selective residues (4x16 format). We have identified many bands that exhibited alterations in band intensity between normal and tumor breast DNA fingerprints. We have cut out the dried gel slices from those bands, eluted and PCR-amplified DNA fragments, and cloned into a plasmid vector. After transformation of E. coli bacteria, the nucleotide sequences of inserts were determined from several transformant clones. For some of the interesting bands, we have also transferred DNA from the DNA fingerprints by electroblotting onto nylon membranes, hybridized those membranes with fragment probes prepared from individual clones, and determined the identity of the fragments showing alterations. From these studies, we have obtained results indicating the possible associations of homeotic genes and related genes in the pathogenesis of breast cancer.
DTIC
Deoxyribonucleic Acid; Genes; Methylation; Polymorphism; Mammary Glands; Cancer; Clinical Medicine

20010020427 Massachusetts Inst. of Tech., Cambridge, MA USA

A Novel Monoallelically Expressed Candidate Tumor Suppressor Gene for Breast Carcingenesis on Chromosome 11p15.5 ***Annual Report***

Praisinger, Elizabeth; Housman, David E.; Jul. 2000; 11p; In English; Original contains color plates

Contract(s)/Grant(s): DAMD17-99-1-9277

Report No.(s): AD-A385585; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

I have identified a novel Xist-like nuclear transcript (11p-xlnt) which is monoallelically expressed and accumulates in the interphase nucleus at its site of transcription. 11p-xlnt is transcribed from within a narrowly defined 500 kb portion of human chromosome 11p15.5 that exhibits loss of heterozygosity (LOH) in 40% of breast cancers. I have shown that 11p-xlnt is transcribed from within an intron of and antisense to the KvLQT gene and spans at least 40 kb of genomic sequence. Construction and screening of a cDNA library failed to reveal evidence of splicing for this large transcript. while transcription appears to be exclusively from the paternal allele in normal tissues, I have shown that expression occurs from both maternal and paternal alleles in a rhabdomyosarcoma cell line, although expression is found to be monoallelic on a single cell basis by RNA FISH. 11p-xlnt may play a pant in local and regional gene regulation at the imprinted domain on chromosome 11p.

DTIC

Cancer; Tumors; Mammary Glands

20010020444 Mayo Foundation, Rochester, MN USA

Alcohol and Adaptation to Mechanical Usage ***Annual Report, 1 Sep. 1999 - 31 Aug. 2000***

Turner, Russel T.; Oct. 2000; 190p; In English

Contract(s)/Grant(s): DAMD17-98-1-8517

Report No.(s): AD-A385538; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

These studies are designed to determine whether ethanol antagonizes the ability of the skeleton to adapt to increased mechanical usage. Ethanol reversibly alters the biophysical properties of cell membranes. The overall hypothesis to be tested in adult rats is that these membrane changes disrupt essential cell signaling pathways for one or more cytokines, growth factors and polypeptide hormones that regulate bone modeling and remodeling. This report summarizes our progress from 01 September 1999 to 31 August 2000. During Year 2 of the award we have continued analysis of experiments performed in Year 1 related to Tasks 1-4 and 8. Additional experiments were performed to accomplish Task 8. Progress was also made on Tasks 6, 7, and 8. The new studies are directed toward determination of the effects of ethanol on: the skeletal readaptation to normal weight bearing following unloading (Task 6), skeletal adaptation to treadmill running (Task 7), PTH-induced increases in mRNA levels for bone matrix proteins (Task 8), and PTH-induced increases in osteoblast number and bone formation (Task 9).

DTIC

Adaptation; Ethyl Alcohol

20010020449 Florida Univ., Gainesville, FL USA

Analytical Analysis of the Vibration Characteristics of Bioaerosols

Hamilton, Troy David, Florida Univ., USA; August 2000; 128p; In English

Report No.(s): AD-A383658; No Copyright; Avail: CASI; A02, Microfiche; A07, Hardcopy

There is a strong need for a field-deployable device that is capable of real-time monitoring of bioaerosols. The threat of airborne biological pathogens, such as bacillus antracis or Anthrax, has greatly increased since the end of the Cold War; especially when they are used as offensive or terrorist weapons. Technologies being used include laser-based fluorescence and light scattering techniques, as well as genetic-based schemes that utilize extracted RNA and DNA samples. These approaches have been the subject of significant research, but studies show that such techniques lack the required specificity necessary for field-deployment. DNA/RNA-based analysis provides the highest degree of specificity, but often requires laboratory equipment or takes too much time for field analysis. This work focuses on an alternative detection scheme that proposes a novel combination of excitation of resonant frequencies of bioaerosols and subsequent detection. This new approach is based on the excitation of the natural resonant frequencies of the targeted bioaerosols and subsequent detection of the frequency-modulated particle. This candidate technique offers the advantages of a relatively low-cost and robust approach that may be readily implemented in a field-deployable package. The main objective of this work is to analyze the feasibility and specificity of natural frequency excitation.

Author

Real Time Operation; Chemical Warfare; Detection; Aerosols

20010020454 Colorado Univ., Natural Hazards Research and Applications Center, Boulder, CO USA
Natural Hazards Observer, Volume 25
Dane, Sylvia C., Editor, Colorado Univ., USA; November 2000; ISSN 0737-5425; 28p; In English
Report No.(s): AD-A383813; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Biological weapons represent a unique 'natural' hazard. The pathogens involved are natural in the sense that they are risks that naturally occur in our environment. However, they are unnatural in the way in which they are inflicted upon society.
Author
Hazards; Risk; Biological Effects; Chemical Warfare; Environment Effects

20010020711
Symposium on irradiation for national development
Adesanmi, C. A.; Ogbadu, G. H.; Dec. 31, 1998; 77p; In English
Report No.(s): DE99-607947; INIS-NG-001; No Copyright; Avail: Department of Energy Information Bridge

This document is the full proceedings of the symposium on irradiation for national development held at SHESTCO in 1996. It contains the full texts of a forward, opening and special remarks, welcome and keynote addresses and abstracts and texts of 23 technical papers. The subjects covered included regulations, codes of practice, irradiation technology in food, agriculture and industry, radiation protection and dosimetry. The questions, answers and comments in the discussion sessions are also included. Additionally, the abstracts of 8 other papers are included. We wish to thank the Coordinator of SHESTCO for making available this proceedings.
NTIS
Agriculture; Radiation Protection; Dosimeters

20010020763 Burnham Inst., La Jolla, CA USA
Training in Support of research Project Entitled "Tumor Cell De-Adhesion by Aberrant, Single Subunit Integrins" ***Final Report, 1 Jul. 1996-30 Jun. 2000***
Zhang, Yan; Jul. 2000; 14p; In English
Contract(s)/Grant(s): DAMD17-96-1-6212
Report No.(s): AD-A385506; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

I hypothesize that there are substantial differences in the plasma membrane complement of metastatic vs non- metastatic tumor cells. to test my hypothesis, I prepared plasma membrane proteins from three breast carcinoma cell lines (MDA-MB-435, MDA-MB-23 1 and MCF-7) of differing degrees of invasiveness, and generated 2D polypeptide expression maps. Computer analysis of the 2D polypeptide patterns showed that the two non-metastatic cell lines (MCF-7 and MDA-MB-23 1) displayed 56% similarity in their proteins, whereas MCF-7 and the highly metastatic cell line, MDA-MB-435, displayed only 42% similarity in their proteins. Further analysis showed 81 polypeptide spots to be unique to the 2D gel of the MDA-MB-43 5 cell line. Five of these proteins were identified using techniques of mass spectrometry and database searching. As an additional method of identifying plasma membrane proteins with relevance to tumor progression, I applied the technique of antibody library phage display. I created scFv antibody libraries to the plasma membrane proteins of MCF-7 and MDA-MB-43 5 cells and enriched these libraries for antibodies to cell-surface proteins. by flow cytometry, I identified an individual phage clone that displays an antibody that recognizes a unique protein on the surface of the metastatic cells. The identification of proteins that are unique to metastatic cells will increase our knowledge of the molecular mechanisms that govern tumor progression.
DTIC
Mammary Glands; Cells (Biology); Investigation; Education

20010020764 Kansas Univ. Center for Research, Inc., Lawrence, KS USA
Probing the Paclitaxel-microtubule Binding Site and Interactions: Design, Synthesis and Evaluation of New Photoaffinity Taxoids ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Spletstoser, Jared; Georg, Gunda I.; Jul. 2000; 33p; In English
Contract(s)/Grant(s): DAMD17-99-1-9243
Report No.(s): AD-A385509; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Paclitaxel (taxol), a structurally complex diterpenoid1 has been developed as a potent drug.against a variety of cancers including breast cancer, ovarian cancer, Kaposi's sarcoma and advanced lung cancer. It possesses unique mechanism of action by binding microtubule and disrupting the microtubule network during cell division. However, the exact paclitaxel binding site on tubulin still remains unclear at the molecular level, and it is essential to understand the interactions of paclitaxel with tubulin and to identify the paclitaxel-tubulin binding interactions on the tubulin peptide in order to design and synthesize more potent analogs of pacli-

taxel. The photoaffinity labeling approach is a very powerful method to identify the paclitaxel binding site and to study the interactions with tubulin. by attaching various photoaffinity labels to the paclitaxel molecule, the photolabeled analogues can be used as probes to map the paclitaxel binding site on tubulin. Based on the proposal, I have successfully designed and prepared some of the photoaffinity analogs modified at c10, c7. The radioactive analogs modified at C7 were also completed. Biological evaluation of these analogs indicated that they possess good microtubule assembly activity and useful for probing paclitaxel binding site studies.
DTIC
Cancer; Mammary Glands; Radioactivity

20010020766 Albany Medical Coll., NY USA
AFP-Derived Peptides Which Stop Breast Cancer Growth ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Mesfin, Fassil; Anderson, Thomas T.; Bennett, James A.; Jul. 2000; 29p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9054
Report No.(s): AD-A385512; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Alpha-fetoprotein (AFP) is a glycoprotein produced during pregnancy by fetal yolk sac and by fetal liver and is a major protein constituent of fetal plasma throughout gestation. It has been shown that fetal physiological levels of human AFP inhibit estrogen-stimulated growth of human breast cancer. The purpose of our work is to derive a stable anti-breast cancer agent from AFP. In the past, we have identified a 14-mer peptide from the Domain III of AFP that retained the full antiestrotrophic activity AFP. In the past year, we have found that an octapeptide, P472-2 (EMTPVNPG) derived from the 14-mer peptide is the minimal sequence required to generate the antiestrotrophic activity of full-length AFP. Peptide P472-2 exhibited dose-dependent inhibition of growth of estrogen-stimulated immature mouse uterus with the optimal dose of 1 ug. P472-2 also inhibited tamoxifen-stimulated growth of immature mouse uterus. However, this activity of P472-2 was diminished during storage in the lyophilized state. Mass spectrometry analysis suggested that there were no chemical modifications during storage. Gel-filtration chromatography suggests that the peptide aggregates to form inactive species during storage. These results suggest that further chemical modification is required to generate an optimal analog with longer shelf-life.
DTIC
Estrogens; Chemical Properties; Peptides; Growth; Fetuses; Cancer; Mammary Glands

20010020770
Design and implementation of a radiotherapy programme: Clinical, medical physics, radiation protection and safety aspects
Sep. 30, 1998; 97p; In English
Report No.(s): DE99-607919; IAEA-TECDOC-1040; No Copyright; Avail: Department of Energy Information Bridge

It is widely acknowledged that the clinical aspects (diagnosis, decision, indication for treatment, follow-up) as well as the procedures related to the physical and technical aspects of patient treatment must be subjected to careful control and planning in order to ensure safe, high quality radiotherapy. While it has long been recognized that the physical aspects of quality assurance in radiotherapy are vital to achieve and effective and safe treatment, it has been increasingly acknowledged only recently that a systematic approach is absolutely necessary to all steps within clinical and technical aspects of a radiotherapy program as well. The present TECDOC is addressed to all professionals and administrators involved in the development, implementation, and management of a radiotherapy program in order to establish a common and consistent framework where all steps and procedures in radiotherapy are taken into account.
NTIS
Radiation Therapy; Quality Control

20010020802 NASA Ames Research Center, Moffett Field, CA USA
Life into Space: Space Life Sciences Experiments, Ames Research Center, Kennedy Space Center, 1991-1998, Including Profiles of 1996-1998 Experiments, ***1991-1998***
Souza, Kenneth, Editor, NASA Ames Research Center, USA; Etheridge, Guy, Editor, NASA Ames Research Center, USA; Callahan, Paul X., Editor, NASA Ames Research Center, USA; August 2000; 568p; In English
Report No.(s): PB2001-100139; NASA/SP-2000-554; NAS 1.21:554; Copyright; Avail: Issuing Activity

We have now conducted space life sciences research for more than four decades. The continuing interest in studying the way living systems function in space derives from two main benefits of that research. First, in order for humans to engage in long-term space travel, we must understand and develop measures to counteract the most detrimental effects of space flight on biological systems. Problems in returning to the conditions of Earth must be kept to a manageable level. Second, increasing our understand-

ing of how organisms function in the absence of gravity gives us new understanding of fundamental biological processes. This information can be used to improve human health and the quality of life on Earth.
Derived from text
Health; Life Sciences; Gravitational Effects; Antigravity

20010020872 Baylor Coll. of Medicine, Houston, TX USA
Research Training Program in Breast Cancer ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Medina, Daniel; Jul. 2000; 37p; In English
Contract(s)/Grant(s): DAMD17-99-1-9073
Report No.(s): AD-A385513; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this research training program is to produce highly qualified scientists for careers as independent investigators in the field of breast cancer. During the last 25 years, there has been a fundamental revolution in the understanding of molecular and cell biological concepts related to cell growth, function and tumorigenesis. to utilize what has been learned and to continue future progress in the area of breast cancer requires the continued availability of well-trained, innovative and committed scientists. This program represents an interdepartmental training program involving fifteen investigators from seven departments. Trainees are predoctoral and postdoctoral fellows with backgrounds in biochemistry, cell and molecular biology, molecular genetics and molecular virology. The training program provided trainees with additional foundation in carcinogenesis and breast cancer. In addition to the core curriculum taken by the predoctoral fellows in their respective academic departments, program enhancement is provided through trainees' participation in a graduate course on "Molecular Carcinogenesis" (predoctoral fellows), a Breast Cancer Seminar Series (all trainees) and participation at national meetings and local seminars. Four predoctoral and two postdoctoral trainees are enrolled in the training program.
DTIC
Research; Viral Diseases; Mammary Glands; Cell Division; Carcinogens; Cancer

20010020873 Temple Univ., Philadelphia, PA USA
Involvement of a Novel Rho GTPase Activating Protein in Breast Tumorigenesis ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Kandpal, Rajendra; Jul. 2000; 16p; In English
Contract(s)/Grant(s): DAMD17-99-1-9394
Report No.(s): AD-A385646; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Tumor suppressors and oncogenes are central players in signal transduction pathways. Ras oncogene is one of the key intermediates that facilitates signal from upstream tyrosine kinases to a downstream cascade of serine/threonine kinases. The members of Rho family of Ras-related proteins are critical downstream components of signaling pathways. The Rho GTPases are involved in a wide spectrum of cellular functions. One of the regulators of Rho GTPases is Rho GTPase activating protein (GAP), which converts active Rho into inactive Rho. We have cloned a Rho GAP encoded by human chromosome 13q12. The sequence motifs of this Rho GAP were characterized and its expression profile in normal breast cell lines and breast carcinoma cell lines was determined. Its expression was much lower in carcinoma cell lines as compared to normal cell lines, and was undetectable in one of the carcinoma cell line tested. The Rho GAP message was highly sensitive to growth conditions. Thus mutations in Rho GAP, its reduced expression, and sensitivity to growth factors could likely enhance the levels of active Rho during breast tumorigenesis.
DTIC
Proteins; Mammary Glands; Cancer

20010020874 Lovelace Institutes, Albuquerque, NM USA
The Physiology of Acute Mountain Sickness in Women ***Final Report, 1 Oct. 1996-31 Dec. 1999***
Loappky, Jack; Feb. 2000; 162p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-96-C-6127
Report No.(s): AD-A385650; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The purpose of this investigation was to determine whether gender, phases of the menstrual cycle or oral contraceptive use by women are significant considerations in assigning military personnel to high altitude duty. In this reported study 18 healthy men and 33 women were exposed for 12 hours to a simulated altitude of 16,000 ft in a decompression chamber. Previous studies have shown that individuals who exhibit altitude sickness within the first half-day at high altitude also experience altitude sickness during the subsequent days at altitude. This chamber study was chosen because it allowed us to control and regulate the environment, activity level and food and fluid intake of the subjects and thereby also learn something about the early progression and development of this poorly understood disease. In two/thirds of the experiments the subjects experienced clear symptoms of altitude sickness, but the occurrence and severity were not different between men and women, menstrual cycle phase? or the use of

oral contraceptives in the repeated exposures in women. In those subjects, men or women, who experienced altitude sickness, the concentrations of fluid regulating hormones changed differently while at altitude than in those subjects who showed no symptoms. These hormone changes, which began early during the exposure, were typical of a strong drive to retain body fluids and this fluid retention probably caused the subsequent headache and other symptoms in the subjects who became sick. This suggests that their body was responding to a shock- like reaction to the initial fall in oxygen levels, which caused instability in the regulation of blood pressure and other functions. This large-scale study failed to reveal any differences of significance in altitude sickness that are related to gender, menstrual cycle or oral contraceptive use.
DTIC
Physiology; High Altitude; Altitude Sickness; Signs and Symptoms; Females; Menstruation; Activity Cycles (Biology); Rhythm (Biology)

20010020876 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA
Collection of Prostate Cancer Families and Mapping Additional Hereditary Prostate Cancer Genes (HPC2, HPC3...) ***Annual Report, 1 Oct. 1998-30 Sep. 1999***
Isaacs, William B.; Oct. 1999; 15p; In English
Contract(s)/Grant(s): DAMD17-98-1-8469
Report No.(s): AD-A385652; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Segregation analyses of familial prostate cancer have supported the existence of dominantly acting prostate cancer susceptibility alleles, with such genes being estimated to be responsible for about nine percent of all cases of prostate cancer in the U.S. These findings provided the basis for our genome wide scan for linkage in hereditary prostate cancer (HPC) families (Smith et al., Science 274:1371, 1996), leading to the identification of the HPCl locus at 1q24- 25 as the first reported linkage in prostate cancer. Since this finding three other HPC loci have been identified, including our finding of the HPGX locus at Xq27-28 (Xu et al. Nat. Gen. 20:175, 1998). These results emphasize the genetic heterogeneity that characterizes HPC. to increase the power of our family collection in an effort to deal with this heterogeneity, we have collected an additional 28 HPC families, each having over 4 individuals affected with prostate cancer. We have begun genotypic analysis of these and our remaining families at a series of putative HPC loci, including loci implicated by other research groups on chromosomes 1 and 8. by accumulating linkage data on our complete set of over 190 HPC families, we will be able to understand and evaluate genetic heterogeneity of HPC, as well as to provide critical positional information for gene mapping and identification studies. Such studies are prerequisite to the development of genetic tests for determination of prostate cancer susceptibility.
DTIC
Prostate Gland; Cancer; Genes; Genetics

20010020965
Oxygen effect and influence of the anoxic radiosensitizing agent TAN on the induction of (lambda)-prophage in polA and wild type E.coli strains after gamma irradiation
Bonev, M. N.; Sivriev, I. K.; Kolev, S. D.; Dec. 31, 1998; 15p; In English
Report No.(s): DE99-602102; JINR-E-19-98-2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The modification effect of both oxygen and radiosensitizing agent TAN on the (lambda)-prophage induction in polA mutant and wild type E.coli cells after (gamma)-irradiation was studied. The oxygen and TAN enhancement ratio concerning the cell sensitivity is more significant in polA mutant cells as compared to that in the wild type ones. The same behaviour has been observed for the oxygen and TAN enhancement ratio for the (lambda)-prophage induction. The TAN effect on the survival and on the (lambda)-induction was smaller than the oxygen effect. The bigger efficiency of oxygen and DNA-radicals are more difficult to repair than those created by an interaction of TAN and DNA-radicals.
NTIS
Anoxia; Gamma Rays; Irradiation; Oxygen

20010021085
R and D of the technology of accelerated formation of bio-functions, ***FY 1997***
Mar. 31, 1998; 24p; In Japanese
Report No.(s): DE99-707605; ETDE/JP-99707605; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

As a part of the study on accelerated formation of bio- functions, analysis technology of experimental systems for in vitro evolution of protein molecules was studied. For the analysis, recognition of a fitness landscape is indispensable. Improvement of adaptive walk is possible through its analysis in an ordered space based on features of the landscape. by the last fiscal year, the knowledge of the fitness (heat-stability) landscape was obtained in the experimental system of PEP (prolyl endopeptidase) in

which an adaptive walk mechanism was found to function effectively (mutated protein with a heat- stability effectively improved by adaptive walk was obtained). to obtain more general fitness landscape information, landscapes of various proteins to a fitness should be examined, and the effectiveness of approaches to efficient adaptive walk on the fitness other than a heat-stability should be clarified. The second experimental system using LOD (lactate oxidase) was thus constructed to examine the heat-stability landscape. In addition, the system of in vitro molecular evolution of proteinase inhibitor (Cystatin B) was constructed.
NTIS
Biotechnology; Biological Evolution; Proteins; Molecules

20010021086
R and D of the application technology of functional protein complex (R and D of the high-functional maintenance technology for power plants), *FY 1997*
Mar. 31, 1998; 187p; In Japanese
Report No.(s): DE99-707606; ETDE/JP-99707606; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In order to develop advanced maintenance technology for power generation facilities, application technology of functional protein complexes is under investigation. On a light controllable enzymatic reaction system, construction of a light controllable bio-reactor by physico-chemical and bio-chemical techniques, and structure and functions of a photosynthetic protein complex using thermophilic cyanobacteria as material are under investigation. On a molecular mechanism for recognition and reaction of receptor proteins, structure analysis and engineering application of glutamate receptor channels of a synaptic transmission system, and basic study and material proteins for artificial structures using endocytic micromachinery, and a multi-enzyme system for synthesis of glycosphingolipids are under investigation. On a complex oxidation/reduction system by genetic engineering technique, construction of a high-efficiency stable system with functionally arranged oxidoreductase and electron transmission systems in biomembranes is in promotion. Research work was also made on molecular assemblies for a functional protein system.
NTIS
Proteins; Complex Systems; Biotechnology

20010021092
Research and development of fusion domains, Part 2, Studies on bionic design, *FY 1997*
Mar. 31, 1998; 88p; In Japanese
Report No.(s): DE99-707627; ETDE/JP-99707627-Pt-2; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Studies were conducted on actuator function in bio materials, cells, structures, and living organisms, and on structuring a biological molecule machine. In the study on soft biological structures, biological compatibility of artificial glass bodies using ultrapolymeric PVA was found very high, raising expectation on feasibility of their practical use. Three-dimensional structure of glass bodies was made clear for the first time in the world. As a result of separating and purifying cells from a liver for the first time in the world, it was indicated that excellent proliferation performance and differentiation into cells are shown. With regard to hydroxyapatite in hard biological structure such as bones and teeth, single crystals were synthesized, and growth rate on the surface C was measured successfully. For molecular motors, studies are being performed on functions of twin-head structure in biological protein enzyme. In molecule structuring, studies were conducted on preparation of a hydrogenase LB membrane as an electric-hydrogen energy conversion element, and structuring of protein molecular structure using gene recombination.
NTIS
Research and Development; Glass; Three Dimensional Bodies

20010021160 Chicago Univ., Chicago, IL USA
Advanced Methods for the Computer-Aided Diagnosis of Lesions in Digital Mammograms *Final Report, 7 Jun. 1996 - 6 Jun. 2000*
Giger, Maryellen; Jul. 2000; 69p; In English
Contract(s)/Grant(s): DAMD17-96-1-6058
Report No.(s): AD-A385721; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The objective of the proposed research is to develop computer-aided diagnosis methods for use in mammography in order to increase the diagnostic accuracy of radiologists. Specifically we have developed advanced computerized schemes for the detection spiculated lesions and architectural distortions based on the calculation of the Hough spectrum and for the detection of small, low-contrast early cancers based on gradient and circularity filters. Also, computerized classification schemes for masses using artificial neural networks, rule-based methods, and hybrid systems have been developed. We have investigated the effect of database on feature selection and classifier training. We also investigated a computerized method for including temporal change

between mammographic examinations. We have also developed an intelligent search workstation for aiding radiologist in making diagnostic decisions by providing them with both CAD output and images of known cases that are 'similar' to the case in question. The efficacy and efficiency of the CAD methods for mammography are being evaluated on a clinical workstation. The potential significance of this research project lies in the fact that if the detectability of cancers can be increased by employing a computer to aid the radiologist's diagnosis, then the treatment of patients with cancer can be initiated earlier and their chance of survival improved.
DTIC
Computer Aided Design; Lesions; Clinical Medicine; Radiology

20010021162 Children's Hospital, Boston, MA USA
Functional Imaging of Multidrug Resistance in Breast Cancer with PET ***Annual Report, 1 Aug. 1999 - 31 Jul. 2000***
Packard, Alan; Aug. 2000; 10p; In English
Contract(s)/Grant(s): DAMD17-99-1-9125
Report No.(s): AD-A385729; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The objective of this project is the development of a PET radiopharmaceutical for the evaluation of multidrug resistance (mdr) in breast cancer. Multidrug resistance is resistance of a lesion to a specific class of drugs that includes many of the chemotherapeutics that are most effective against breast cancer and is characterized by the increased concentration of P-glycoprotein (Pgp), a 170 kD transmembrane glycoprotein, which reduces the intracellular concentration of these drugs to non-toxic levels. Lipophilic cationic complexes such as Tc-99m-MIBI are substrates for Pgp and are now being studied for evaluation of mdr function in vivo. We are currently carrying out in vivo and in vitro studies of lipophilic cationic Cu-64-based PET mdr radiopharmaceuticals as possible PET mdr radiopharmaceuticals. A PET mdr tracer will provide significant advantages over Tc-9mm-MIBI, and the half-life of Cu-64 (12.7 h) is better matched to the apparent biological half-life of the mdr process (approx. 240 min.) than are other PET radionuclides (e.g., C-11, T 1/2 = 11 min). These radiopharmaceuticals may provide information about the mdr status of breast cancer lesions that will allow optimization of treatment protocols, monitoring of the development of acquired resistance, and real-time evaluation of the effectiveness of drugs developed to modulate mdr.
DTIC
Drugs; Imaging Techniques; Mammary Glands; Pharmacology; Tolerances (Physiology); Resistance

20010021163 Yale Univ., New Haven, CT USA
Growth Factor Antagonism in Breast Cancer Chemotherapy ***Annual Report, 1 May 1999 - 30 Apr. 2000***
Hamilton, Andrew; May 2000; 19p; In English
Contract(s)/Grant(s): DAMD17-99-1-9458
Report No.(s): AD-A385735; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The primary focus of this project is the first step in the aberrant cell signaling pathways that lead to uncontrolled proliferation and cancer, namely the interaction of growth factors with their receptor tyrosine kinases (RTKs). Our principal goal is to design growth factor antagonists that can inhibit ligand-induced receptor activation as a route to novel anti-cancer drugs. During the past year we have made important progress is establishing the goals of this project. We have developed efficient and direct synthetic routes to protein binding agents. We have extended our approach with the synthesis of some tetraphenylporphyrin based receptors that bind to proteins with high affinity. Most importantly, we have demonstrated that a member of our first generation of protein binding agents is able to bind to the surface of platelet derived growth factor. This binding is strong (IC50 is less than 250nM) under physiological conditions and is sufficient to block the activation of PDGF receptor tyrosine kinase. These results represent important steps is establishing the novel approach to breast cancer treatment that is the foundation of this project.
DTIC
Chemotherapy; Mammary Glands; Cancer; Growth; Aberration; Abnormalities

20010021164 California Univ., Los Angeles, CA USA
Prostate Specific Gene Therapy Using a 'Gutless' Adene-Vector Expressing Antisense TGF-Beta and PSA Promotor-Control ***Annual Report, 1 Sep. 1998 - 31 Aug. 1999***
Belldegrun, Arie; Sep. 1999; 76p; In English
Contract(s)/Grant(s): DAMD17-98-1-8564
Report No.(s): AD-A385737; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A gene therapy protocol that can achieve exquisite prostate cancer restricted expression of cytotoxic genes will minimize systemic side effects. Thus, we designed our prostate specific therapeutic scheme using the well-characterized Prostate Specific Antigen PSA enhancer/promoter (PSE). We have generated new constructs that increase the transcriptional activity greatly over

the natural version. High in vivo expression coupled with its specificity will hold the best chance for effective therapy in patients. We have taken a combined approach of targeted cytotoxicity and generation of a tumor-specific immune response with reversal of local immunosuppression. We aim to achieve this gene therapy scheme with the most advanced
DTIC
Prostate Gland; Therapy; Genes; Cancer

20010021175 Texas Univ., Houston, TX USA
Training Entitled Development and Characterization of Transgenic Mice With Mammary Gland Specific Expression of the Tumor Suppressor ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Cuevas, Bruce; Jul. 2000; 31p; In English
Contract(s)/Grant(s): DAMD17-99-1-9262
Report No.(s): AD-A385442; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The signal transduction protein phosphatidylinositol 3-kinase (PI3K) phosphorylates membrane constituent phosphatidylinositols, producing second messengers that link membrane bound receptor signals to cellular proliferation and survival. The dysregulation of the PI3K signal transduction pathway has been associated with tumorigenesis. The tumor suppressor PTEN/MMACl is a multispecific phosphatase that is a major negative regulator of PI3K, and PTEN/MMACl is frequently mutated in advanced cancers. We have produced four breast-targeted transgenic mouse models that express either the PTEN/MMACl wild-type or phosphatase-inactive proteins under the control of either the murine mammary tumor virus (MMTV) promoter or the whey acidic protein (WAP) promoter. These models are being characterized as part of our effort to understand the role of PTEN in breast tumorigenesis. In addition to these models, we have employed cell line model systems to further define the role PTEN/MMACl in PI3K signaling. We have determined that, dependent on the culture conditions, PTEN/MMACl expression can induce either apoptosis or cell cycle arrest in breast cancer cell lines and that loss of PTEN/MMACl is associated with an increase in the duration of ligand-induced signaling through the PI3K pathway. Our results are supportive of PTEN/MMACl being a breast tumor suppressor that functions by regulating the PI3K signaling pathway.
DTIC
Mice; Mammary Glands; Suppressors; Cancer

20010021197 North Carolina Univ., Chapel Hill, NC USA
Cloning of Novel Oncogenes Involved in Human Breast Cancer ***Annual Report, 1 Jun. 1999 - 30 May 2000***
Der, Channing; Jun. 2000; 10p; In English
Contract(s)/Grant(s): DAMD17-99-1-7050
Report No.(s): AD-A385419; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

During the past year, we initiated our own efforts to utilize cDNA expression libraries in retrovirus vectors to screen for novel oncogenes. We have collected 8 breast cancer samples, representing either localized, noninvasive tumor tissue from invasive cancers. The rationale for choosing the noninvasive samples was that this screen would involve the identification of oncogenes involved in tumor progression, and hence, may serve as important diagnostic markers for early detection. The rationale for using the invasive tumor tissue is that these cancer cells are likely to harbor more genetic defects that noninvasive tumor cells and consequently, our chances of detection are increased. A second rationale for studying late stage cancers is that oncogenes involved promoting invasion and metastases may be identified. The identification of such genes are obviously important as both diagnostic markers for metastases and as targets for drug discovery.
DTIC
Cloning (Biology); Mammary Glands; Cancer

20010021198 Pennsylvania State Univ., University Park, PA USA
Leptin Regulation of Mammary Cell Growth ***Annual Report, 1 Aug. 1999-31 Jul. 2000***
Pighetti, Gina; Baumrucker, Craig; Aug. 2000; 9p; In English
Contract(s)/Grant(s): DAMD17-99-1-9344
Report No.(s): AD-A385420; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The risk of developing breast cancer rises with obesity, however the cause of this phenomenon is unknown. An intriguing candidate is leptin, a protein produced almost exclusively by adipocytes, a prominent stromal component in mammary tissue. The studies of this proposal were designed to test the hypothesis that the interaction of leptin with its receptor regulates normal and pathologic mammary epithelial cell proliferation and/or differentiation. As part of my training, I have demonstrated that leptin prevents growth factor induced cellular proliferation and DNA synthesis. I hypothesize that leptin may force mammary epithelial cells from a proliferation to a differentiation pathway. However, the observed responses were small and difficult to analyze. This

necessitated the development of an in vitro culture system that would more accurately determine the functional consequences of leptin action through the leptin receptors. The culture of HC11 mammary epithelial cells on a collagen matrix induces the expression of leptin receptor long mRNA. However, upon addition of insulin/epidermal growth factor this expression is lost. More work is necessary to refine this system to accurately portray the consequences of leptin effects on mammary epithelial cells and is currently in progress. Complementing my research training has been my participation in meetings and manuscript/grant submissions.
DTIC
Cancer; Mammary Glands; Cells (Biology); Adipose Tissues; Proteins

20010021199 Texas Univ., Southwestern Medical School, Dallas, TX USA
Characterization of Putative Homeostatic Molecules in Prostate Development and Androgen-Independent Prostate Cancer ***Annual Report, 1 Jan. - 31 Dec. 1999***
Heleh, Jer-Tsong; Jan. 2000; 23p; In English
Contract(s)/Grant(s): DAMD17-99-1-9002
Report No.(s): AD-A385421; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The goal of this study is to define the signal pathway(s) elicited by two homeostatic genes, C-CAM1 and DOC-2, in the basal cells of normal prostate. Prostate basal cells have been shown to have similar biologic properties to the androgen-independent (AI) prostate cancer. The outcome of this study can improve the current treatment strategy for AI prostate cancer. structurally, C-CAM1 is a cell adhesion molecule with receptor kinase motif in the C-terminus. Together with DOC-2, a typical signal molecule, we believe that both genes play an important role in controlling the growth and differentiation of prostatic epithelia. Our results indicate that both C-CAM1 and DOC-2 are down-regulated in Al prostate cancer and increased expression of individual gene can inhibit cancer growth. We have further defined the functional domain in both genes which modulate their tumor suppression activities. More detailed analyses are underway for C-CAM1 protein. For DOC-2 protein, it appears that DOC-2 can interact with an novel protein that belongs to the Ras GTPase-activating protein (GAP) family. Ras-GAP is a key factor to maintain the balance of both active and inactive status of Ras protein. Our finding signifies the critical role of DOC-2 in prostate development and carcinogenesis.
DTIC
Prostate Gland; Molecules; Cancer; Homeostasis

20010021200 Iowa Univ., Iowa City, IA USA
Illness Among Persian Gulf War Veterans: Case Validation Studies ***Annual Report, 25 Sep. 1999-25 Sep. 2000***
Doebbeling, Bradley N.; Oct. 2000; 33p; In English
Contract(s)/Grant(s): DAMD17-97-1-7355
Report No.(s): AD-A385422; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We recently completed a population-based, cross-sectional/cohort telephone survey of 4,886 military personnel to compare the prevalence of self-reported symptoms and illnesses among military personnel either deployed, or eligible but not deployed, during the Gulf War (JAMA, 1997). The proposed series of case-validation and case-control studies nested within our population-based study, should provide an estimate of the true magnitude of the problem. Because of the magnitude of the difference in prevalence between these groups, it is critical to explore and characterize their cognitive deficits, depression, and multisystemic conditions. The primary purpose of the current project is to compare the true rate of confirmed disease among samples of veterans not deployed, with and without these self-reported conditions. Furthermore, we also plan to identify risk factors for each disease outcome of interest including medical and family history, psychological factors, and occupational and environmental exposures for validated illness in a series of nested case-control studies. Year 3 of 4 has just been completed. Through September 2000, 456 subjects have been assessed, with a participation rate of 65%. Recruitment, assessment, and data collection, entry, and validation efforts are ongoing. We are in the process of data editing, database linkage and planning and programming analyses.
DTIC
Persian Gulf; Signs and Symptoms; Armed Forces; Epidemiology; Occupational Diseases; Exposure; Sicknesses

20010021201 California Univ., Los Angeles, CA USA
Gene Delivery for Metastatic Prostate Cancer Cells ***Annual Report, 1 Jan.-31 Dec. 1999***
Pang, Shen; Jan. 2000; 12p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9033
Report No.(s): AD-A385423; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed a prostate-specific vector to deliver the diphtheria toxin A gene into cancer cells. Using liposome-mediate DNA transfection, the vector specifically destroys prostate cancer cells. Enhanced by the by-stander effect, the specific expression

of the diphtheria toxin A gene causes significant cell death in prostate cancer cell culture, with very low background in the control cell lines. The highly specific and efficient cytopathicity combined with low immunogenicity of the diphtheria toxin A gene vector will potentially be useful for systemic treatment of patients with metastatic prostate cancer.
DTIC
Cancer; Prostate Gland; Deoxyribonucleic Acid; Cells (Biology); Culture Techniques; Genes

20010021203 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA
Prediction of Pathologic Fracture Risk in Activities of Daily Living and Rehabilitation of Patients with Metastatic Breast Carcinoma of the Pelvis and Femur ***Annual Report, 15 Jul. 1999-14 Jul. 2000***
Inoue, Nozomu; Aug. 2000; 14p; In English
Contract(s)/Grant(s): DAMD17-99-1-9239
Report No.(s): AD-A385425; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of the project is to develop a computer model of the pelvis and proximal femur which can be used to predict the pathologic fracture risk and study the effects of pelvic and proximal femoral metastatic bone lesions on the care and management of breast cancer patients. The scope of the research is to construct graphical and quantitative models of the pelvis and proximal femur on computer workstations including Finite Element Method (FEM) and Discrete Element Method (DEM) to study the stress and strain in the pelvis and proximal femur and pressure distribution of the hip joint in the patient with metastatic bone lesions of the breast cancer in the pelvis and proximal femur with interactive capability. A database of the metastatic breast cancer to the pelvis and femur has been established for modeling the pelvis and femur with metastatic breast carcinoma. An interactive DEM model has been developed to calculate the pressure distribution of the hip joint with the bone defect. A pilot study of motion capture was performed to determine an appropriate system for acquisition of kinematic data in Activity in Daily Living, rehabilitation program, and nursing care for the metastatic breast cancer patients.
DTIC
Cancer; Mammary Glands; Fracturing; Pelvis; Femur; Computerized Simulation; Bones; Lesions; Risk; Patients

20010021204 Fox Chase Cancer Center, Philadelphia, PA USA
Facilitating Breast Cancer Genetic Counseling through Information, Preparation and Referral: A Pilot Program Using the Cancer Information Service ***Annual Report, 8 Jun. 1998 - 7 Jun. 1999***
Miller, Suzanne M.; Jul. 1999; 65p; In English
Contract(s)/Grant(s): DAMD17-98-1-8306
Report No.(s): AD-A385426; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The present study aims to increase a woman's knowledge of: (1) the factors that determine genetic predisposition to breast/ovarian cancer, (2) personal family history and other risk factors, (3) the benefits and drawbacks of genetic testing for breast/ovarian cancer, (4) the range of surveillance and preventive behaviors available and, (5) the process of genetic testing. Participants will be 200 women who have contacted the Cancer Information Service (CIS) requesting information on inherited breast/ovarian cancer. Women will be randomly assigned to a standard or enhanced intervention testing the effectiveness of the CIS in increasing a woman's knowledge of inherited disease, risk assessment and genetic testing. As planned, this first year was dedicated to a formative evaluation of the informational/emotional needs of women pursuing risk assessment services. The structured interviews and focus groups conducted with women from the lay population, women at high risk and genetic counselors informed the development of the enhanced intervention. The interviews/groups supported previous research demonstrating that women are unprepared for and have limited knowledge about the process and outcomes of risk assessment for genetic predisposition to breast/ovarian cancer. A comprehensive training program and formalized standard protocol will ensure competence and consistency when accrual begins in the Pall.
DTIC
Mammary Glands; Cancer; Genetics

20010021205 Wistar Inst. of Anatomy and Biology, Philadelphia, PA USA
Interaction of p53 with 14-3-3 ***Annual Report, 15 Apr. 1999-14 Apr. 2000***
Halazonetis, Thanos; May 2000; 11p; In English
Contract(s)/Grant(s): DAMD17-99-1-9455
Report No.(s): AD-A385429; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The p53 tumor suppressor protein is a sequence-specific DNA binding transcription factor that induces cell cycle arrest or apoptosis in response to DNA damage. We had previously demonstrated that ionizing radiation (IR) leads to association of p53 with 14-3-3 in breast cancer cells and hypothesized that this association activates the tumor suppressor function of p53. to test

this hypothesis, we had proposed to determine whether the interaction of p53 with 14-3-3 affects: (1) the sequence-specific DNA binding activity of p53 (months 1-12); (2) the cell cycle arrest and/or apoptotic functions of p53 (months 13-24); and (3) p53 intracellular localization and half-life (months 25-36). During the first year of funding we have began to address Tasks 1 and 2. We have established that the interaction of p53 with 14-3-3 is critical for the ability of p53 to induce cell cycle arrest (Task 2), but appears to not affect the DNA binding activity of p53 (Task 1). Overall, the results support the initial hypothesis that the interaction of p53 with 14-3-3 activates the tumor suppressor function of p53, but also indicate that the mechanism might not be through activation of the sequence-specific DNA binding activity of p53, as originally thought.
DTIC
Suppressors; Cancer; Mammary Glands; Proteins; Ionizing Radiation; Deoxyribonucleic Acid

20010021206 Thomas Jefferson Univ., Philadelphia, PA USA
HRAD51 Involvement in Genomic Instability and Development of Breast Cancer ***Annual Report, 23 Aug. 1999-24 Aug. 2000***
Fishel, Richard A.; Sep. 2000; 14p; In English
Contract(s)/Grant(s): DAMD17-99-1-9406
Report No.(s): AD-A385431; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It becomes increasingly clear that both BRCA1 and BRCA2 tumor suppressor genes are involved in hRAD51-dependent DNA repair by homologous recombination. In this study, we will test whether DNA recombinational repair may be compromised during breast cancer development. We first examined the hRAD51 gene in tumors with 15q14-15 deletions. We did not find any changes compared to normal tissue which supports (among other possibilities, see accompanying reprint) the notion that hRAD51 is an essential gene. We have also examined interactions among members of the hRAD51 protein family and between hRAD51 family members and BRCA1/2. All hRAD51 homologs seem to exist in a multiprotein complex (hRAD51 proteome), and examination of the functional significance of these interactions is currently in progress.
DTIC
Cancer; Mammary Glands; Genetic Engineering; Deoxyribonucleic Acid; Suppressors; Genes

20010021207 RAND Corp., Santa Monica, CA USA
Quality of Care for Women: A Review of Selected Clinical Conditions and Quality Indicators
McGlynn, Elizabeth A.; Kerr, Eve A.; Damberg, Cheryl L.; Asch, Steven M.; Jan. 2000; 448p; In English
Report No.(s): AD-A385432; RAND/MR-1284-NCFA; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

This report is one of a series of volumes describing the QA Tools, a comprehensive, clinically based system for assessing care for children and adults. The quality indicators that comprise these Tools cover 46 clinical areas and all 4 functions of medicine--screening, diagnosis, treatment, and follow-up. The indicators also cover a variety of modes of providing care, including history, physical examination, laboratory study, medication, and other interventions and contacts. Development of each indicator was based on a review of the literature. Each volume documents the literature on which the indicators were based, explains how the clinical areas and indicators were selected, and describes what is included in the overall system. The QA Tools were developed with funding from public and private sponsors the Health Care Financing Administration, the Agency for Healthcare Research and Quality, the California HealthCare Foundation, and the Robert Wood Johnson Foundation.
DTIC
Clinical Medicine; Diagnosis; Children; Health; Females; Physical Examinations

20010021212 Toledo Univ., OH USA
Measurement of the Electron Density Distribution of Estrogens-A First Step to Advanced Drug Design ***Annual Report, 15 Jul. 1999-14 Jul. 00***
Pinkerton, Alan; Aug. 2000; 72p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9408
Report No.(s): AD-A385441; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Estradiol and related compounds bind as ligands to the estrogen receptor initiating biological reactions, which can cause either initiation/progress or inhibition of tumor growth. Slight structural variations in these molecules can change their carcinostatic potentials from agonistic to inhibitory. The principal objective of this proposal is to relate known biological reactions to physical properties such as point charges of atoms and the electrostatic potential. We are obtaining information about these electronic properties of estrogen derivatives from experimental determination of their electron density using high quality single crystal X-ray crystallography. With the completion of the first electron density experiment of an estradiol derivative, we have proven, that the technique will indeed work for molecules of this magnitude. We have determined the electrostatic potential and related properties

for estrogen. Further data sets of 17 alpha-estradiol.l/2 H20 and l7 beta- estradiol.l/2 MeOH have been collected and are under investigation. Comparison of electronic properties of several estrogen derivatives is essential in order to identify certain regions of the electrostatic potential of a ligand that can be related to biological functionality. Furthermore, we solved the X-ray structures of three new crystal modifications of estradiol derivatives, which add to the overall knowledge about estradiols.
DTIC
Electron Density (Concentration); Estrogens; Cancer; Mammary Glands; Density Distribution; Ligands; Drugs; Crystals

20010021230 Colorado Univ., Boulder, CO USA
Mechanisms for Breast Cancer Cell Resistance to Doxorubicin and Solutions to Resistance and Side Effects (97 Breast) ***Annual Report, 15 Sep. 1998-14 Sep. 1999***
Koch, Tad; Oct. 1999; 21p; In English; Original contains color plates
Report No.(s): AD-A385448; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recent studies indicate that doxorubicin alkylates DNA through catalytic production of formaldehyde and utilization of formaldehyde for attaching itself to 0-bases. This discovery prompted the synthesis of anthracycline-formaldehyde conjugates as improved anti-tumor dmgs. The first conjugate, Doxoform, was equally toxic to both sensitive and resistant breast cancer cells but is predicted to be hydrolytically too unstable. The second conjugate, Epidoxoform, from reaction of epidoxorubicin with formaldehyde was synthesized and characterized and proved to be less toxic to breast cancer cells but more stable with respect to hydrolysis to epidoxorubicin. The following additional results with Doxoform and Epidoxoform were obtained during the first budget period: 1) The structure of epidoxombicin-alkylated DNA, solved by x-ray crystallography, shows the epidoxombicin virtually crosslinking the DNA at NOC sites. 2) Flow cytometry measurements show drug-formaldehyde conjugates are taken up better by both sensitive and resistant breast cancer cells and retained longer than their clinical counterparts. 3) The nucleus of both sensitive and resistant cancer cells is the primary target for drug-formaldehyde conjugates. 4) Drug-formaldehyde conjugates are more toxic to breast cancer cells than confluent mammary epithelial cells.
DTIC
Cancer; Mammary Glands; Crosslinking; Deoxyribonucleic Acid; Cells (Biology)

20010021233 Georgetown Univ., Washington, DC USA
A Novel Negative Regulator of Angiogenesis ***Final Report, 1 Aug. 1998 - 31 Jul. 2000***
Li, Luyuan; Aug. 2000; 59p; In English
Contract(s)/Grant(s): DAMD17-98-1-8093
Report No.(s): AD-A385715; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Vascular endothelial growth inhibitor (VEGI), a novel cytokine of the TNF-superfamily, is produced predominantly by endothelial cells and exhibits potent anti-angiogenic and anti-cancer activities (Zhai et al., Int. J. Cancer, 82:131, 1999). We report here that the effect of VEGI on endothelial cells is cell-cycle dependent: it mediates an early G1 arrest in quiescent cells, but induces apoptotic death in proliferating cells. VEGI inhibits DNA synthesis in GO-synchronized adult bovine aortic endothelial (ABAE) cells, which do not express VEGI themselves. The inhibition was reversible once VEGI was removed from the culture media. VEGI treated GO-cells lacked typical markers of late G1 phase, such as the hyperphosphorylation of the retinoblastoma gene product (pRB) and the upregulation of the c-myc gene, suggesting an early G1 arrest. In contrast, exposure of ABAE cells of logarithmic growth phase to VEGI resulted in apoptotic cell death. Consistently, VEGI expression in human umbilical cord vein endothelial cells (HUVEC) was found to be markedly upregulated in confluent cells when compared to proliferating cells. These findings support the view that VEGI may play a role in the maintenance of the low turn over rate of the endothelium of an established vasculature.
DTIC
Regulators; Blood Vessels; Inhibitors; Endothelium; Cells (Biology)

20010021234 Baylor Coll. of Medicine, Houston, TX USA
Role of the SOS Response in Stationary-Phase Hypermutation: A Model for Mutation in Oncogenesis and Chemotherapeutic Drug-Resistance ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
McKenzie, Gregory; Jul. 2000; 40p; In English
Contract(s)/Grant(s): DAMD17-99-1-9072
Report No.(s): AD-A385716; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The SOS response of Escherichia coli is the prototypic DNA damage repair and cell cycle checkpoint control system. It is analogous to checkpoint control in eukaryotes. The SOS response includes blocking the cell cycle, global mutagenesis via more than one mechanism, and up regulation of DNA repair and recombination functions. Adaptive mutation is a mutational program

in non-growing cells subjected to starvation and so is also a temporary mutagenic response to environmental stress. It entails global hypermutation, and previously, the signal transduction pathway from the environment to the DNA was unknown. Here we demonstrate that adaptive mutation of a lac allele in E. coli is under control of the SOS response. Although homologous recombination and recombination protein RecA (the prokaryotic homologue of hRad51 and other human DNA repair proteins) are required for lac adaptive mutation, we find that SOS induced levels of component(s) other than or in addition to RecA are also involved. We report a partial requirement for RecF, a recombination protein and SOS regulator, and find that the sole function of RecF in adaptive mutation is to allow SOS induction of SOS-controlled genes. We also report the discovery of an SOS-controlled factor that inhibits adaptive mutation, psiB. These results indicate that adaptive mutation is a tightly temporally regulated mutational response, controlled positively and negatively by the SOS system. In addition, we report preliminary results describing the role of damage-inducible DinB in adaptive mutation.
DTIC
Mutations; Drugs; Chemotherapy; Escherichia; Mutagenesis

20010021235 Missouri Univ., Columbia, MO USA
Viral Vectors Selective for Metastatic Breast Cancer Tumor Cells ***Annual Report, 1 Oct. 1998 - 1 Oct. 1999***
Folk, William; Nov. 1999; 6p; In English
Contract(s)/Grant(s): DAMD17-98-1-8321
Report No.(s): AD-A385718; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Breast cancer is The most common malignancy in American women, and its most life-threatening aspect is metastasis. There are presently no effective means to treat metastatic cancer, and novel therapies are required to eliminate metastatic cells and the consequent morbidity and mortality of breast cancer. We are developing polyomavirus gene therapy vectors which are capable of specifically targeting metastatic breast cancer cells. Selective targeting will result from the specific attachment of modified viruses to urokinase plasminogen activator (uPA) expressed on metastatic cells and to the selective expression of genes under the control of promoters which are preferentially activated in metastatic cells. These gene therapy vectors will be assembled from highly purified capsid proteins, histones and DNA and will be tested in human breast cancer cells in culture and in tumors. During the past year, we have modified the polyomavirus VP1 capsid protein to contain sequences of uPA capable of binding to the uPA receptors on tumor cells. We have obtained the requisite enzymes for assembling DNA into chromatin. The next year will be devoted to assembling virus-like particles with the modified capsid proteins and the chromatin, and to preparing to test them for specificity of adsorption to cancer cells.
DTIC
Viruses; Cancer; Mammary Glands

20010021236 Georgetown Univ., Washington, DC USA
Early Detection Based on Angiogenic Growth Factors in Nipple Aspirate Fluid ***Annual Report, 1 Jul. 1998 - 30 Jun. 1999***
Trock, Bruce J.; Jul. 1999; 14p; In English
Contract(s)/Grant(s): DAMD17-98-1-8097
Report No.(s): AD-A385719; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The objective of this proposal is to develop new methods of early breast cancer detection by identifying increases in angiogenic growth factor secretion in nipple aspirate fluid (NAF). Specifically, the study is examining FGF-2 (basic fibroblast growth factor) and VEGF (vascular endothelial growth factor), two of the most potent angiogenic molecules whose expression is thought to increase as an early event in breast carcinogenesis. by comparing levels of these growth factors in NAF samples from 40 women in each of three groups, i.e.; those with normal breasts, DCIS (ductal carcinoma in situ), and early invasive breast cancer, we will determine whether increases in either of these molecules heralds the transition to the preinvasive and/or invasive phenotype. In this first year of the study efforts have focused on methods and infrastructure. We have determined the most appropriate means of handling and processing the samples to prevent degradation of FGF-2 and VEGF. Accrual of patients has been slower than expected, primarily due to staffing changes at the three clinics providing subjects for this study, and a greater proportion of patients than found in our previous experience whose concern for their health status precluded interest in participating in the study. to increase accrual we have increased the percentage effort of the Research Assistant (using institutional funds) and have also engaged the efforts of additional surgeons to refer patients to the study.
DTIC
Cancer; Mammary Glands; Detection; Clinical Medicine; Secretions

20010021238 Letterman Army Inst. of Research, Div. of Military Trauma, San Francisco, CA USA

Overt Vitamin B-6 Deficiency Affects Rat Pancreatic Digestive Enzyme and Glutathione Reductase Activities ***Final Report***

Dubick, Michael A., Letterman Army Inst. of Research, USA; Gretz, Denise, Department of Agriculture, USA; Majumdar, Adhip P. N., Wayne State Univ., USA; Journal of Nutrition; January 1995; ISSN 0022-3166; Volume 125, pp. 20-25; In English

Contract(s)/Grant(s): DA Proj. 3M1-61101-A-91-C

Report No.(s): AD-A383550; DA335367; Copyright; Avail: Defense Technical Information Center (DTIC)

Previous reports suggest that vitamin B-6 deficiency contributes to pancreatic insufficiency. However, the susceptibility of pancreatic function to marginal vitamin B-6 intake has not been defined. The present study examines digestive enzyme activity and steady-state mRNA levels, as well as antioxidant enzyme status from rats fed different vitamin B-6 diets. Groups (n=12) of adult female Long-Evans rats were assigned to five dietary groups and fed their respective diets for 6 wk. Control and food-restricted rats were fed the control diet (7 mg pyridoxine/kg diet) freely, or food intake was restricted to the lowest intake of the experimental groups. The experimental groups were fed purified diets containing O (deficient), 0.25 or 1 (marginal) mg pyridoxine/kg diet. Plasma amylase and pancreatic amylase, trypsin and chymotrypsin activities were significantly lower in deficient rats compared with rats fed the control diet. Lower enzyme activities were accompanied by 83 and 55% lower amylase and trypsinogen mRNA levels compared with levels in rats fed the control diet. Other than low glutathione reductase in deficient rats, pancreatic antioxidant enzyme activity was similar in all dietary groups. These data suggest that the exocrine pancreas is impaired by vitamin B-6 deficiency, but marginal pyridoxine intake maintains function.

DTIC

Digestive System; Glutathione; Pancreas; Rats; Enzyme Activity; Pyridoxine; Diets

20010021294 Nebraska Univ., Lincoln, NE USA

Fermentation, Recovery, and Purification of the HC Fragments of the Botulinum Neurotoxin from Pichia Pastoris ***Annual Report, 12 May 1999-11 May 2000***

Meagher, Michael M.; Jun. 2000; 78p; In English

Contract(s)/Grant(s): DAMD17-98-C-8034

Report No.(s): AD-A384855; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The report documents the research and development activities on BoNTC Hc, BoNTF Hc, and BoNTE Hc. BoNTC Hc research focused on characterizing the capture of the BoNTC Hc from P. pastoris lysate and the interference of DNA-type material on the binding of BoNTC Hc to a anion exchange column. BoNTF Hc process development was concerned with confirmation of a process developed by USARMIID transferred to Covance and tested at UN-L. UN-L found two steps needed further development, i.e. cell breakage conditions and one chromatographic condition. This process was scaled-up to the pilot scale and transferred back to USAMRIID. Fermentation research at the UN-L focused on developing standard fermentation protocols that can be easily transferred to Covance. The BoNTC sub 1 Hc P. pastoris fermentation process was successfully developed and optimized using a quantifiable Western blot procedure. Also, a fermentation process for BoNTE Hc express in E. coil was developed and conditions were determined for expression of soluble material. UN-L also provided fermentation support for BoNT D, B, and E Hc for both USAMRIID and UN-L purification activities. The Quality Assurance/Quality Control group at UN-L established multiple pre-seeds for clones developed at USAMRIID and established batch records for the BoTNF Hc process.

DTIC

Fermentation; Clostridium Botulinum; Research and Development; Toxins and Antitoxins

20010021295 Howard Univ., Washington, DC USA

Modulation of Adhesion Molecule Expression on Prostate Tumor Cells After Co-Culture With EOSinophilic Cell Lines ***Annual Report, 1 Oct. 1998-30 Sep. 1999***

Furbert-Harris, Paulette; Oct. 1999; 39p; In English

Contract(s)/Grant(s): DAMD17-98-1-8485

Report No.(s): AD-A384854; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have demonstration that cell lines developed from metrizamide density fractions of peripheral blood hypodense (.22) and hyperdense (.24) eosinophils significantly inhibited LNCaP3, PC3, DU145 and HPC1 monolayer growth cultures in vitro. This activity was enhanced when the eosinophils were pretreated with interleukin-5. DU145 and PC3 colony formation was inhibited 50-75% by eosinophil cell lines, while peripheral blood eosinophils inhibited PC3 colony formation by as much as 95%. 24hr. cultured eosinophil supernatants significantly inhibited PC3 colony formation with 3/7 supematants causing 100% inhibition. Inhibitory activity of the 24hr. supematants towards DU145 was more variable, ranging from 9-90% inhibition of colony formation. There was slight enhancement of growth with one preparation. IL-4 and TNFalpha, which were found present in the supema-

tants also inhibited growth of monolayers cultures of PC3, DU145 and HPC1. These data strongly support the hypothesis that eosinophils can destroy prostate tumor cells in vitro. The eosinophil cell lines and cytokine modulation of their activity offer an exquisite tool for more detailed study (both cellular and molecular) of a role for eosinophils as anti-prostate cancer effector cells.
DTIC
Cancer; Prostate Gland; EOSinophils; Growth; Culture Techniques

20010021305 University of Southern Illinois, Carbondale, IL USA
American Ginseng in the Prevention and Treatment of Human Breast Cancer ***Annual Report, 1 Aug. 1999 - 31 Jul. 2000***
Murphy, Laura; Aug. 2000; 12p; In English
Contract(s)/Grant(s): DAMD17-99-1-9380
Report No.(s): AD-A385433; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This study is examining the effects of American ginseng on human breast cancer cell proliferation in vitro and in vivo. An extract of American ginseng was shown to significantly decrease MCF-7 and MDA-MB-231 human breast cancer cell proliferation in vitro in a dose-dependent manner. The IC50 for ginseng extract on MCF-7 cell proliferation was 1.1 x 10(exp -3) g/ml, and for MDA-MB-231 cells the IC50 was 2.3 x 10(exp -3) g/ml. The ginseng extract also significantly decreased tumor size in female nude mice inoculated with MDA-MB-231 human breast cancer cells and exposed to a 1% ginseng extract in their drinking water during the experiment. Analysis of the ginseng extract using HPLC demonstrated the presence of 7 identifiable ginsenosides, Rb1, Rb2, Rc, Rd, Re, Rf, and Rg1. When MDA-MB-231 or MCF-7 cells were incubated in the presence of a 50 micro-M concentration of ginsenoside, only ginsenoside Rc produced profound inhibition of cell proliferation; after 8 days of treatment, Rc-exposed cells were reduced by over 75% of control. The other ginsenosides had no effect on breast cancer cell proliferation. Thus, American ginseng extract and ginsenoside Rc may have potential preventative or therapeutic effects for breast cancer in humans.
DTIC
Cancer; Mammary Glands; Cells (Biology)

20010021306 Ontario Cancer Inst., Toronto, Ontario Canada
Role of IGF-II in Mammary Tumorigenesis and its Modulation by TIMP-1 ***Annual Report, 1 Jul. 1999 - 1 Jul. 2000***
Moorehead, Roger; Khokha, Rama; Aug. 2000; 76p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9345
Report No.(s): AD-A385451; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

The bioavailability of IGF-II, a molecule implicated in breast tumorigenesis, was recently shown by our laboratory to be modulated by TlMP-1 through controlling MM P-mediated IGFBP degradation. to investigate the exact role of IGF-II in breast tumorigenesis and examine IGF-II mediated events potentially regulated by TIMP-I expression we generated independent MMTV-IGF-II transgenic mice. Since increased proliferation and/or decreased apoptosis precede tumor development, we investigated the effects of IGF-II overexpression on proliferation during mammary development and its effect on apoptosis during postlactation involution. We found that elevated levels of IGF-II inhibitied mammary epithelial proliferation in vivo. The delay in ductal morphogenesis correlated with an elevation of the phosphatase PTEN, in the transgenic tissue. Higher PTEN levels resulted in reduced phosphorylation of Akt/PKB and a subsequent reduction in cylcin DI protein levels. We have also observed a delay in ductal morphogenesis when the oncogene, erbB2 is overexpressed. IGF-II overexpression also affected epithelial apoptosis in vivo. Specifically, high levels of IGF-II resulted in delayed postlaction involution through inhibiting mammary epithelial apoptosis. This inhibition of apoptosis was associated with a sustained phosphorylation of Akt/PKB in the transgenic tissue. These data demonstrate that an elevation IGF-II can affect the pre-tumorigenic events, events potentially controllable through manipulating TIMP-I.
DTIC
Mammary Glands; Tumors; Modulation; Molecules

20010021378 California Univ., San Francisco, CA USA
Engineering of Specific Tissue Inhibitors to Block ADAM Type Metalloprotease-Mediated Mammary Neoplasia ***Annual Report, 1 Jul. 1999-30 Jun. 2000***
Yan, Yibing; Werb, Z.; Jul. 2000; 15p; In English
Contract(s)/Grant(s): DAMD17-98-1-8193
Report No.(s): AD-A385554; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mammary tumors derive from mammary epithelial cells that lost the control for both cell growth and differentiation. Activation of a G protein coupled receptor (GPCR) transactivates the EGF receptor (EGFR) growth signal by inducing metalloprotease

dependent release of the EGFR ligand HB-EGF. Here we demonstrated that expression of a membrane bound ADAM Kuzbanian (KUZ) in COS-7 cells stimulates the transactivation of EGFR by bombesin, while a dominant negative form of KUZ (DNK), which lacks the protease domain blocked endogenous protease mediated tranactivation. This transactivation process was very sensitive to the inhibitors of ADAM type metalloprotease, the EGFR autophosphorylation, and HG-EGF. The role of KUZ in this trans activation appeared to be specific, since evolutionarily close related ADAM TACE did not elicit the transactivation. These results show that KUZ is the physiologically relevant metalloprotease that mediates the transactivation of EGFR by GPCR through enhancing the supply of HB-EGF. to investigate the effect of blocking KUZ in mammary neoplasia, transgenic mice conditionally expressing DNK, mutant TIMP3 and activated Notch4 have been constructed.
DTIC
Neoplasms; Cancer; Epithelium; Tissues (Biology); Mammary Glands; Inhibitors; Cell Division

20010021389 National Inst. of Allergy and Infectious Diseases, Lab. of Allergic Diseases, Bethesda, MD USA
Human Mast Cells Produce the CD4(+) T Lymphocyte Chemoattractant Factor, IL-16
Rumsaeng, Vanitcha, National Inst. of Allergy and Infectious Diseases, USA; Cruikshank, William W., Boston Univ., USA; Foster, Barbara, National Inst. of Allergy and Infectious Diseases, USA; Prussin, Calman, National Inst. of Allergy and Infectious Diseases, USA; Kirshenbaum, Arnold S., National Inst. of Allergy and Infectious Diseases, USA; Davis, Thomas A., Naval Medical Research Inst., USA; Kornfeld, Hardy, Boston Univ., USA; Center, David M., Boston Univ., USA; Metcalfe, Dean D., National Inst. of Allergy and Infectious Diseases, USA; Journal of Immunology; 1997; ISSN 0022-1767, pp. 2904-2910; In English
Contract(s)/Grant(s): M0095.003.1458
Report No.(s): AD-A384002; Copyright; Avail: Defense Technical Information Center (DTIC)

CD4(+) T cell infiltration is known to occur in tissues at sites of mast cell activation. The molecules produced and released by mast cells that account for this lymphocyte accumulation are poorly characterized. here we report that a CD4(+) T cell chemoattractant cytokine, IL-16, is stored preformed in bone marrow-cultured human mast cells and a human mast cell line, HMC-1, as demonstrated by intracytoplasmic cytokine staining and flow cytometry, and in human lung mast cells, as detected by immunohistochemistry. In response to the anaphylatoxin, C5a, or to PMA treatment, IL-16 mRNA transcripts detected by Northern blot analysis in HMC-1 cells increased 6- to 10-fold. HMC-1 cell lysates and activated supermatants contained IL-16 protein, as demonstrated by both ELISA and in vitro lymphocyte chemotaxis assays, the latter of which was blocked 59 to 88% by the addition of neutralizing Ab to recombinant human IL-16. IL-16 bioactivity was detected in the supermatants 2 to 4 h after PMA or C5a activation, and this activity remained elevated through 24 h. The capacity of human mast cells to synthesize and release biologically active IL-16 provides a possible link between mast cell activation and the accumulation of T cells in mast cell-dependent inflammation, thus amplifying the immune response and perpetuating the pathologic process.
DTIC
Lymphocytes; Immune Systems; Immunoassay; Biochemistry; Bioassay

20010021395 NASA Ames Research Center, Moffett Field, CA USA
The Turbulent Life of Phytoplankton
Ghosal, S., Northwestern Univ., USA; Rogers, M., NASA Ames Research Center, USA; Wray, A., NASA Ames Research Center, USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 31-45; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Phytoplankton is a generic name for photosynthesizing microscopic organisms that inhabit the upper sunlit layer (euphotic zone) of almost all oceans and bodies of freshwater. They are agents for ”primary production,” the incorporation of carbon from the environment into living organisms, a process that, sustains the aquatic food web. It is estimated that phytoplankton contribute about half of the global primary production, the other half being due to terrestrial plants. by sustaining the aquatic food web and controlling the biogeochemical cycles through primary production, phytoplankton exert a dominant influence on life on earth. Turbulence influences this process in three very important ways. First, essential mineral nutrients are transported from the deeper layers to the euphotic zone through turbulence. Second, turbulence helps to suspend phytoplankton in the euphotic zone since in still water, the phytoplankton, especially the larger species, tend to settle out of the sunlit layers. Third, turbulence transports phytoplankton from the surface to the dark sterile waters, and this is an important mechanism of loss. Thus, stable phytoplankton populations are maintained through a delicate dynamic balance between the processes of turbulence, reproduction, and sinking. The first quantitative model for this was introduced by Riley, Stommel and Bumpus in 1949. This is an attempt to extend their efforts through a combination of analysis and computer simulation in order to better understand the principal qualitative aspects of the physical/biological coupling of this natural system.
Author
Computerized Simulation; Phytoplankton; Turbulence; Direct Numerical Simulation; Mathematical Models; Turbulent Flow

20010021469 Austin Research Inst., Heidelberg, Australia

Vaccine Development Against Novel Breast Cancer Antigens ***Annual Report, 2 Aug. 1999 - 1 Aug. 2000***

McKenzie, Ian; Sep. 2000; 23p; In English

Contract(s)/Grant(s): DAMD17-99-1-9067

Report No.(s): AD-A385205; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of these studies were to produce new antigens overexpressed in breast cancer; to immunise mice with these, particularly using new modes of immunisation including oxidised mannan and to measure the ensuing antibody and cellular responses and ultimately determine the effect of using multiple antigens on tumour growth in mice. In the first year of the project a number of antigens have or are being made including nm23, p53; Her2/neu is in the process of being produced, and an additional antigen, glycosylated whole human MUC1, is in the process of being engineered and produced. Although the original application cited cytotoxicity as the mode of testing, we have been busy establishing an ELISPOT assay and can distinguish between gammaIFN production by CD4 and CD8 cells. Immunisation methods have been refined, targeting the mannose receptor is being compared with various prime boost strategies and a new mode of immunisation has been designed. Progress is satisfactory and we are poised to push ahead with the studies in years 02 and 03.

DTIC

Antigens; Vaccines; Cancer; Mammary Glands; Antibodies

20010021470 American Society for Microbiology, Washington, DC USA

ASM Conference on Macromolecular Transport Across Cellular Membranes ***Final Report, 1 May - 30 Jul. 2000***

Jensen, Robert; Sep. 2000; 42p; In English; Macromolecular Transport Across Cellular Membranes, 31 May - 4 Jun. 2000, Savannah, GA, USA

Contract(s)/Grant(s): DAMD17-00-1-0592

Report No.(s): AD-A385233; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy; Abstracts Only; Abstracts Only

Partial Contents: How are Macromolecules Selected and Targeted for Translocation?, Molecular Recognition of Newly Synthesized Peroxisomal Proteins Protein, and Peptide Translocation from the ER Lumen to the Cytosol, GTP-Dependence of Signal Recognition Particle Binding to Ribosome-bound Signal Sequences, How are Macromolecules Selected and Targeted for Translocation?, A Family of Receptors for Targeting Preproteins to Chloroplasts, Characterization and Subcellular Localization of the Peroxisomal Membrane Protein, PMP5O, The Physiological Basis for the Conservation of the Signal Recognition Perticle Targeting Pathway in E.Coli, Mechanism of Protein Import into the Peroxisomal Matrix and Membrane, A Family of Receptors for Targeting Preproteins to Chloroplasts, Retrotranslocation and Degradation of Integral Membrane Proteins, What Components Comprise the Translocating Sites or Translocons? How are Proteins Arranged in Translocating Sites? How does the Translocon Interact with Macromolecules in Transit?, Insertion of Polytopic Proteins into the Mitochondrial Inner Membrane, Yidc, the E. coli Homologue of Mitochondrial Oxaip is a Component of the Sec Translocase.

DTIC

Mitochondria; Membranes; Chloroplasts; Escherichia; Macromolecules; Peptides; Proteins; Cells (Biology)

20010021471 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA

Novel Peptide/Protein Delivery System Targeting erbB2-Overexpressing Breast Cancer Cells ***Annual Report, 1 Aug. 1999 - 31 Jul. 2000***

Yu, Dihau; Aug. 2000; 9p; In English

Contract(s)/Grant(s): DAMD17-99-1-9271

Report No.(s): AD-A385234; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A major goal of this Idea proposal is to determine whether the penetratin-based peptide delivery system may be developed to effectively deliver anti-cancer therapeutic peptides/proteins into breast cancer cells. We have fulfilled the objective 1 (Tasks 1-3) during the first year of the grant support. Although we experienced initial difficulties labeling the peptides with FITC, we finally were able to succeed in chemical synthesis of FITC-labeled penetratin peptides. When evaluating the translocation abilities of penetratin peptides in breast cancer cells, we were excited to find that the shortened FITC-YGRKKRRQR peptide was able to penetrate into breast cancer cells efficiently. Systematic studies of this penetratin delivery peptide in breast cancer cells, including the effective dose range, delivery efficiency, tolerable doses, stability etc. have led to better understanding of the properties of these peptides. Most importantly, we have found that the shortened FITC-YGRKKRRQR peptide can selectively translocate into the cytoplasmic subcellular compartment without going into nucleus as did the original penetratin peptide. These works

pointed a very positive direction for the next grant-support year, when will test the effect of erbB2 signal-blocking peptides using penetratin delivery system, which may be developed into new therapeutic agents.
DTIC
Peptides; Proteins; Mammary Glands; Cancer; Blocking; Cells (Biology)

20010021488 Institute of Space Medico-Engineering, Beijing, China
Disquisition of a New Quantitative Dilution Method for Bacterial Culture
Ba, Fu-Sen, Institute of Space Medico-Engineering, China; Wu, Hui-Bin, Institute of Space Medico-Engineering, China; Zhang, Hong, Institute of Space Medico-Engineering, China; Li, Jian-Qiu, Institute of Space Medico-Engineering, China; Wang, Hui-Juan, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 456-458; In Chinese; Copyright; Avail: Issuing Activity

To investigate the advantage of a serial dilution method in quantitative bacterial culture by inserting a small metallic stick into an injector and continuously stirring on a magnetic mixer. Quantitation of standard or identified bacterial strains such as E. bacillus, E. faecilis, B. infantis, L. acidophilus Bacteroides fragilis as well as intestinal flora in diarrhea animal models were compared. The new method is simple, convenient, economical, easy to operate and effective in quantitative analysis of various specimens. There is no statistical difference (P greater than 0.05) between two methods. This new method of serial dilution provides a useful tool in quantitative bacterial culture and micro flora assay.
Author
Bacteria; Dilution; Quantitative Analysis; Microanalysis; Procedures

20010021499 Academia Sinica, Inst. of Genetics, Beijing, China
Molecular Analysis of Space Mutant Line of Kidney Bean
Zhang, Jian, Academia Sinica, China; Li, Jin-Guo, Academia Sinica, China; Wang, Pei-Sheng, Academia Sinica, China; Wang, Xiao-Qin, Academia Sinica, China; Jiang, Xing-Cun, Academia Sinica, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 410-413; In Chinese; Copyright; Avail: Issuing Activity

The objective is to identify the occurance of gene mutant in mutant lines in the offspring of Kidney bean seeds under space flight condition. Method: Kidney bean seeds were carried onboard a recoverable satellite for 15 days in space and were planted on the ground after recovery. Five mutant lines showing variation in the form of leaf blade and their parents were analyzed with RAPD technique. Result: 50 random 10-mer primers were used in this study, among which 20 primers generated 180 ploymorphic DNA bands, their size ranged from 200 bp to 2000 bp. 3 primers amplified obviously different bands in the DNA of mutant lines in comparison with that of the control. Conclusion: This is the first molecular analysis of the mutant lines of Kidney bean generated by space mutagenesis at DNA level. The result of RAPD analysis indicated that distinct variations were demonstrated in the DNA of mutant lines as compared with that of the original control.
Author
Mutagenesis; Seeds; Flight Conditions; Genes

20010021556 Gordon Research Conferences, Inc., Kingston, RI USA
1999 Gordon Research Conference on Lipid Metabolism ***Final Report***
Dowhan, William; Apr. 14, 2000; 15p; In English; Molecular and Cellular Biology of Lipids, 27 Jun. - 2 Jul. 1999, Meriden, NH, USA
Contract(s)/Grant(s): DAAD19-99-1-0151
Report No.(s): AD-A385622; ARO-39775.1-LS-CF; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The 1999 Gordon Research Conference on Molecular and Cellular Biology of Lipids was held June 27 - July 2 at Kimball Union Academy in Meriden, NH. The attendees represented a broad group of participants. Each session brought out new and important information in the following fields: Biochemistry and Genetics of Lipid A; Lipid Movement and Translocation; Vesicle Trafficking and Lipid Transfer Proteins; Lipids as Signaling Molecules; Genetics and Biochemistry of Sterol Metabolism; Genetics and Biochemistry of Lipid Metabolism in Somatic Cells; Lipid Metabolism in Microbial Systems; Phospholipid-Lipid Interactions; and Fatty Acid and Triacylglycerol Metabolism.
DTIC
Biochemistry; Molecular Biology; Lipid Metabolism

20010021587 Fourth Military Medical Univ., Dept. of Aerospace, Xi'an, China

Counteracting Effects of Intermittent Head-Up Tilt on Simulated-Weightlessness Induced Atrophy of Antigravity Muscles

Liu, Chun, Fourth Military Medical Univ., China; Zhang, Li-Fan, Fourth Military Medical Univ., China; Zhang, Le-Ning, Fourth Military Medical Univ., China; Ni, He-Ying, Fourth Military Medical Univ., China; Zhang, Yuan-Qiang, Fourth Military Medical Univ., China; Sun, Lan, Fourth Military Medical Univ., China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 391-395; In Chinese; Copyright; Avail: Issuing Activity

To study the efficacy of intermittent + Gz (45 deg head-up tilt, HUT) exposures in preventing or alleviating atrophic changes in hind limb muscles induced by simulated weightlessness. Male Sprague-Dawley (SD) rats were assigned randomly to one of three groups: simultaneous control (CON),simulated weightlessness (SUS),and SUS plus 6 h/d HUT (SUS+ HUT). Muscles examined included soleus (SOL), medial grastrocnemius (MG), lateral grastrocnemius (LG) and extensor digitorum. longus (EDL). Sections were treated with an adenosine triphosphatase (ATPase) stain or alkaline phosphatase stain. The cross-sectional areas (CSA) of fibers, the relative proportion of type I fiber and the ratio of capillaries/ fibers (C/F) were measured using Leica image analysis system. Compared with CON, the wet weight of hind limb muscles in SUS were significantly reduced. The changes of wet weight in different groups were various. The C/F ratios of all muscles were significantly reduced. SUS + HUT rats showed significant increases in SOL and MG wet weight, and the relative counter-effects of intermittent HUT were 93.4 % and 34.8 %, respectively. In SUS + HUT group, the CSA of both type I and II fibers and relative proportion of type I fibers were completely recovered in SOL, and partially recovered in MG, while the counter-effects were much less obvious in the fibers of LG and EDL. However, HUT resulted in a significant recovery of the C/F ratios in all muscles. The present study demonstrated that intermittent HUT is effective in counteracting the atrophy induced by simulated weightlessness. The result that reactivity to HUT varied among different muscles suggests that the intermittent artificial gravity should be complemented with other countermeasures. Author

Antigravity; Artificial Gravity; Atrophy; Countermeasures; Muscles; Weightlessness Simulation

20010021588 I. I. Mel'nikov Central Scientific Research Inst. of Vaccines and Sera, Moscow, Russia

Phagocytic Activity of Neutrophils and Humoral Factors of Systemic and Local Immunity During Intensive Physical Loads

Petrova, I. V.; Kuzmin, S. N.; Kurshakova, T. S.; Suzdal'nitskiy, R. S.; Pershin, B. B.; Kovalenko, Ye. B.; Levando, V. A.; Moshiashvili, I. Ya.; [1983], pp. 53-57; In English; Translated into English by Leo Kanner Associates, Redweed City, CA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In sport medicine, the importance of phagocytosis indexes during the training cycle is determined not only by the important role played by phagocytic cells in human natural resistance, but also by their correspondence with the functional state of athletes discovered in recent years, which is the basis for the rational regulation of training cycles. However, there is the possibility of an erroneous evaluation of the athlete's condition, prognostically speaking, since the determination of the other immunologic indexes characterizing the body's resistance to infectious agents is not carried out. considering that one of the main substances promoting phagocytosis are antibodies, we set out to study, at the same time, the phagocytic activity of neutrophils and to determine the levels of normal serum and secretory antibodies and immunoglobulins in athletes as physical loads were increased in time and intensity. Derived from text

Athletes; Education; Clinical Medicine; Sports Medicine; Exercise Physiology; Physical Fitness

20010021624 Civil Aeromedical Inst., Oklahoma City, OK USA

Effects of Napping on Night Shift Performance ***Final Report***

Della Rocco, P. S.; Comperatore, C.; Caldwell, L.; Cruz, C.; Feb. 2000; 42p; In English; Original contains color illustrations Report No.(s): PB2001-102912; DOR/FAA/AM-00/10; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This study represents a collaborative effort between the Federal Aviation Administration's Civil Aeromedical Institute and the US Army Aeromedical Research Laboratory to investigate the effects of napping on the midnight shift as a potential counter-measure to sleepiness during the shift. The purpose of the present paper was to examine the patterns of performance degradation along with the subjective measures of mood, sleep quality, and sleepiness as a function of napping condition and time on task during the midnight shift. Sixty Air Traffic Control Specialists (ATCSs) were randomly assigned to one of the three midnight shift napping conditions: a long nap (LN) of 2 hours, a short nap (SN) of 45 minutes, and a no nap condition (NN). ATCSs completed a four-day protocol during which they worked three early morning shifts (0700-1500) followed by a rapid rotation to the midnight shift (2300-0700). Subjects completed three 1.5 hour test sessions (one session before the nap and 2 sessions after the nap) during the midnight shift involving two computer-based tasks: (1) the Air Traffic Scenarios Test (ATST), a task developed for selection of ATCSs, and (2) the Bakan, a test of vigilance. Data were analyzed using repeated measures analysis of variance and post-hoc

multiple comparisons. Both cognitive performance and subjective measures of sleepiness supported the use of naps during the midnight shift. In fact, both the long nap of 2 hours and the short nap of 45 minutes resulted in better performance than no nap on the Bakan test at the end of the midnight shift. A dose-response relationship existed such that the long nap also resulted in better performance than the short nap. The ATST, on the other hand, was much less sensitive to differences in napping condition and even to the natural circadian trough, which would have been expected to affect all groups.
NTIS
Aerospace Medicine; Air Traffic Controllers (Personnel); Sleep; Night; Mental Performance; Sleep Deprivation

20010021661 Naval Medical Research Inst., Malaria Program, Bethesda, MD USA
Degenerate Cytotoxic T Cell Epitopes from P, falciparum Restricted by Multiple HLA-A and HLA-B Supertype Alleles
Doolan, Denise L., Naval Medical Research Inst., USA; Hoffman, Stephen L., Naval Medical Research Inst., USA; Southwood, Scott, Cytel Corp., USA; Wentworth, Peggy A., Cytel Corp., USA; Sidney, John, Cytel Corp., USA; Chestnut, Robert W., Cytel Corp., USA; Keogh, Elissa, Cytel Corp., USA; Appella, Ettore, National Cancer Inst., USA; Nutman, Thomas, National Inst. of Allergy and Infectious Diseases, USA; Lal, Altaf A., Centers for Disease Control and Prevention, USA; Immunity; July 1997; Volume 7, pp. 97-112; In English
Contract(s)/Grant(s): NIH-N01-A1-4524
Report No.(s): AD-A384585; Copyright; Avail: Defense Technical Information Center (DTIC)
We recently described leukocyte antigen (HLA) A2, A3, and B7 supertypes, characterized by largely overlapping peptide-binding specificities and represented in a high percentage of different populations. Here, we identified 17 Plasmodium falciparum peptides capable of binding these supertypes and assessed antigenicity in both vaccinated and naturally expressed populations. Positive cytotoxic T lymphocyte recall and cytokine (interferon-gamma and tumor necrosis factor alpha) responses were were detected for all peptides; all were recognized in the context of more than one HLA class 1 molecule; at least 12 of the 17 were recognized in the context of all HLA alleles studied.These data validate the concept of HLA supertypes at the biological level, show that highly degenerate peptides are almost always recognized as epitopes, and demonstrate the feasibility of developing a universally effective vaccine by focusing on a limited number of peptide specificities.
Derived from text
Toxins and Antitoxins; Leukocytes; Tumors; Lymphocytes; Peptides; Antigens

20010021664 Naval Medical Research Inst., Resuscitative Medicine Research Program, Bethesda, MD USA
Lipopolysaccharide-Responsive Protein Kinase C Isotypes in the Adult Aorta
McKenna, Thomas M., Naval Medical Research Inst., USA; Fan, Sharon X., Naval Medical Research Inst., USA; Li, Shao-Hua, Naval Medical Research Inst., USA; SHOCK; 1997; Volume 7, No. 4, pp. 269-273; In English
Contract(s)/Grant(s): MM33C30.001-1417
Report No.(s): AD-A384571; Copyright; Avail: Defense Technical Information Center (DTIC)
Previous studies have shown that protein kinase C (PKC) activity increases in cardiovascular tissue exposed to lipopolysaccharide (LPS). The objective of these experiments was to identify the PKC isotypes that to LPS treatment in the adult rat aorta. We found that PKC(alpha), -delta, -epsilon, and -zeta isotypes are present in endothelium-intact aortas. The PKC(alpha) and -epsilon isotypes show two- to threefold increases in abundance after three h treatment with 100 ng/mL LPS while PKC(delta) and -zeta levels do not increase. In contrast, mRNA for all of the PKC isotypes increased 3.5 to 12-fold during LPS treatment. Both PKC isotype amd mRNA levels gradually diminished during 20 h of continuous LPS exposure. Concurrent treatment of the vessels with LPS plus 50 microM cycloheximide caused PKC(alpha), -epsilon, and -zeta, but not -delta, isotypes to to rapidly decrease in abundance while blunting the increase in PKC isotype mRNA. The major source for all of the PKC isotypes in the vessel is the vascular smooth muscle cells. These results indicate that LPS treatment induces time-dependent increases in PKC isotype mRNA expression and isotype-specific PKC activation and synthesis in vascular tissue.
Author
Cardiovascular System; Endothelium; Proteins; Muscles

20010021747 Georgetown Univ., Medical Center, Washington, DC USA
Ribozyme Targeting the Novel Fusion Junction of EGFRvIII in Breast Cancer ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Tang, Careen; Jul. 2000; 12p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9206
Report No.(s): AD-A385642; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
EGFRvIII is a tumor specific, ligand-independent, constitutively active variant of the epidermal growth factor receptor. Its expression has been detected in gliomas and various other human malignancies. In order to evaluate the importance of EGFRvIII

expression in human breast cancer, we examined the frequency of EGFRvIII protein expression immunohistochemically in paraffin embedded specimens from 109 patients with breast cancer. With a specific anti-EGFRvIII antibody, 67% (73 of 109) of primary breast carcinomas and 16% of DCIS (2/12) expressed EGFRvIII. No EGFRvIII expression was detected in normal breast tissue and benign tumors. We also observed 56% (413 of 564) in a breast cancer tissue microarray. These results confirm our pilot studies and suggested that expression of EGFRvIII may play a crucial role in breast cancer progression. to delineate the biological significance of EGFRvIII in human breast cancer, we expressed EGFRvIII in MCF-7 human breast cancer cells. Expression of EGFRvIII in MCF-7 produced a constitutively activated EGFRvIII receptor. These MCF-7/EGFRvIII transfectants exhibited approximately a three-fold increase in colony formation in 1% serum with no significant effect observed at higher percentages of serum. Collectively, these results provide the first evidence that EGFRvIII could play a pivotal role in human breast cancer progression.
DTIC
Mammary Glands; Cancer; Neoplasms

20010021749 National Inst. of Health, Bethesda, MD USA
STAT5A Regulates the Survival of Mammary Epithelial Cells and the Development of Mammary Cancer ***Annual Report, 1 Jul. 1999 - 30 Jun. 2000***
Humphreys, Robin; Jul. 2000; 28p; In English; Original contains color plates
Contract(s)/Grant(s): DAMD17-99-1-9328
Report No.(s): AD-A385738; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The in vivo relationship between epidermal growth factor (EGF) and prolactin/Jak/Stat signaling pathways in mammary gland development and tumorigenesis was explored in transgenic nice overexpressing the TGF alpha gene (TGFalphaTG) and lacking the prolactin-activated transcription factor, Stat5a (Stat5aKO/TGFalphaTG). We present evidence that Stat5a has a crucial role regulating programmed cell death (PCD) during mammary gland involution and the development of EGF-dependent tumorigenesis. TGFaalphaTG mice exhibit delayed mammary gland involution and the absence of Stat5a facilitated involution-associated changes in morphology and the extent and timing of PCD. Stat5a remained phosphorylated through involution in TGFalphaTG suggesting that Stat5a is constituitively 'activated' by the EGF signaling pathway. These results demonstrated TGFalpha epithelium is prevented from progressing into the normal pattern of involution and apoptosis by the 'activated' form of Stat5a. This activated Stat5a affected EGF-receptor initiated mammary gland tumorigenesis. Overexpression of TGFalpha in mammary epithelium generates mammary hyperplasia and tumors. In the presence of an activated EGF receptor, deletion of Stat5a delayed initial hyperplasia and mammary tumor development by 6 weeks. These observations demonstrate that Stat5a is a survival factor, is required for mammary gland epithelium to resist regression and involution-mediated apoptosis and can influence the development of mammary gland tumorigenesis.
DTIC
Cancer; Mammary Glands; Epithelium; Cells (Biology)

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AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

20010019868 Civil Aeromedical Inst., Oklahoma City, OK USA
Galactic Cosmic Radiation Exposure of Pregnant Aircrew Members, 2
Nicholas, Joyce S., Medical Univ. of South Carolina, USA; Copeland, Kyle, Civil Aeromedical Inst., USA; Duke, Frances E., Civil Aeromedical Inst., USA; Friedberg, Wallace, Civil Aeromedical Inst., USA; OBrien, Keran, III, University of Northern Arizona, USA; October 2000; 8p; In English
Report No.(s): AD-A385597; DOT/FAA/AM-00/33; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

In its 1990 recommendation regarding occupational exposure during pregnancy, the International Commission on Radiological Protection apparently assumed that the equivalent dose to a pregnant woman's abdomen is reduced by half in traversing the body to the conceptus. This assumption was tested with respect to galactic cosmic radiation, the principal ionizing radiation to which aircrews are exposed. We calculated the equivalent dose that would be received at depths of 0, 5, 10, and 15 centimeters in a 30-centimeter thick, soft-tissue slab phantom, at several locations in the atmosphere and on two air carrier flights, and found that the dose was almost the same at all the tissue depths studied. Thus, the assumption of considerable shielding of the conceptus

by the woman's body is not valid with respect to galactic cosmic radiation. The effective dose of galactic radiation to the mother was found to be a good estimate of the equivalent dose to the conceptus.
DTIC
Pregnancy; Radiation Effects; Galactic Cosmic Rays; Flight Crews; Aerospace Medicine; Ionizing Radiation; Exposure

20010020127 Arizona Univ., Tucson, AZ USA
Immunotoxicology of JP-8 Jet Fuel ***Final Report, 15 Nov. 1997-14 Nov. 2000***
Harris, David T.; Nov. 2000; 17p; In English
Contract(s)/Grant(s): F49620-98-1-0074
Report No.(s): AD-A385744; AFRL-SR-BL-TR-00-0674; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Chronic jet fuel exposure could be detrimental to Air Force personnel, not only by adversely affecting their work performance but also by predisposing these individuals to increased incidences of infectious disease and cancer. Chronic exposure to jet fuel has been shown to adversely affect human liver function, to cause emotional dysfunction, to cause abnormal electroencephalograms, to cause shortened attention spans, and to decrease sensorimotor speed. Currently, there are no standards for personnel exposure to jet fuels of any kind, let alone JP-8 jet fuel. Kerosene based petroleum distillates have been associated with hepatic, renal, neurologic and pulmonary toxicity in animals models and human occupational exposures. The U.S. Department of Labor, Bureau of Labor Statistics estimates that over 1.3 million workers were exposed to jet fuels in 1992. Thus, jet fuel exposure may not only have serious consequences for USAF personnel, but also may have potential harmful effects upon a significant number of civilian workers. Short-term (7 day) JP-8 jet fuel exposure causes lung injury as evidenced by increased pulmonary resistance, a decrease in bronchoalveolar lavage concentrations of substance P, increased wet lung/body weight ratio, and increased alveolar permeability. Long-term exposures, although demonstrating evidence of lung recovery, results in injury to secondary organs such as liver, kidneys and spleen.
DTIC
JP-8 Jet Fuel; Toxicity; Cancer; Infectious Diseases

20010020172 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Year 2000 Computing Crisis: Medicare and the Delivery of Health Services Are at Risk. Statement of Joel C. Willemssen, Director, Civil Agencies Information Systems Accounting and Information Management Division
Feb. 24, 1999; 22p; In English
Report No.(s): PB2001-101658; GAO/T-AIMD-99-89; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report provides information on the readiness of automated systems that support the nation's delivery of health benefits and services to function reliably without interruption through the term of the century. This includes the ability of Medicare to provide accurate benefits and services to millions of Americans and the overall readiness of the health care sector, including such key elements as biomedical equipment used in the delivery of health services.
NTIS
Systems Management; Medical Services; Information Systems; Health; Congressional Reports; Automatic Control; Computer Networks

20010020363 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Thermal and Environmental Injury, Section 26, Burn Injury
Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Goodwin, Cleon W., Jr., Army Inst. of Surgical Research, USA; Robson, Martin C., Editor; Moore, Ernest E., Editor; Early Care of the Injured Patient; 1990, pp. 286-306; In English
Report No.(s): AD-A383588; Copyright; Avail: Defense Technical Information Center (DTIC)

Tissue heating and cell injury can be produced by exposure to hot liquids, flames, chemical agents, and electricity. The resulting tissue damage elicits the changes in all organ systems that typify the response to any injury. The magnitude and duration of that biophasic response, in general characterized by early hypofunction and later hyperfunctions, are proportional to the extent of burn. The priorities of burn patient care change with time in accord with the predominant dysfunctional organ system. In the immediate postburn period the increase in capillary permeability permits loss of fluid from the vascular compartment and accumulation of edema in the area of injury. Early care of burn patients--the first 24 to 48 hours--is focused on prevention of correction of the consequences of fluid sequestration, e.g., hypovolemia, extremity ischemia, and airway obstruction. Electric injury and chemical injury may necessitate modification of both the magnitude and priority of therapy, with treatment of the burn wound taking immediate precedence only in patients with chemical burns.
Author
Burns (Injuries); Injuries; Patients; Priorities; Therapy

20010020364 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Burn Center for Patients with Toxic Epidermal Necrolysis ***Final Report***

Kelemen, John J., III, Brooke Army Medical Center, USA; Cioffi, William G., Army Inst. of Surgical Research, USA; McManus, William F., Army Inst. of Surgical Research, USA; Mason, Arthur D., Jr., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Journal of the American College of Surgeons; March 1995; Volume 180, pp. 273-278; In English

Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874

Report No.(s): AD-A383564; Copyright; Avail: Defense Technical Information Center (DTIC)

Toxic epidermal necrolysis (TEN) is a life threatening exfoliative disorder that is most commonly precipitated by the administration of a medication. Efforts to reduce morbidity and improve survival have brought into question the use of corticosteroids and recommend the transfer of patients to a burn center to facilitate wound care. This study evaluated the correlation of measures of disease severity and impact of treatment strategies on morbitidy and mortality in patients with TEN. The records of all patients with TEN admitted to the US Army Institute of Surgical Research during and 12 year period were reviewed. Patient characteristics, etiologic agents, time to referral of patients to the burn center, corticosteroid therapy, and other demographic features were studied. Univariate and multivariate analyses were used to determine the significance of these factors with respect to outcome. The sulfonamines and phenytoin were the most frequently identified etiologic agents. Patients at the extremes of age had a higher mortality rate. The period of hospitalization was longer in patients transferred to the burn center more than seven days after skin slough. Percent of epidermalysis, white blood cell count nadir, and corticosteroid administration for more than 48 hours were independently associated with mortality. These data indicate that the sulfonamides and phenytoin are the most common etiologic agents, expeditions transfer to a burn center reduces morbidity, and corticosteroid administration dramatically increases mortality. Author

Corticosteroids; Mortality; Survival; Therapy; Toxicity

20010020365 Army Inst. of Surgical Research, Mechanical Trauma Research Branch, Fort Sam Houston, TX USA

Comparison of 7.5% NaCl/6% Dextran-70 Resuscitation of Hemorrhage Between Euhydrated and Dehydrated Sheep ***Final Report***

Sondeen, Jill L., Army Inst. of Surgical Research, USA; Gunther, Robert A., California Univ., USA; Dubick, Michael A., Army Inst. of Surgical Research, USA; Shock; January 1995; Volume 3, No. 1, pp. 63-68; In English; 6th; Hypertonic Resusitation, 2-3 Jun. 1994, Teton Village, WY, USA

Contract(s)/Grant(s): DA Proj. 3S4-64807-D-832

Report No.(s): AD-A383561; DA-314428; Copyright; Avail: Defense Technical Information Center (DTIC)

7.5% NaCl/6% destran-70 (HSD) has been shown to be an effective, small volume resuscitation fluid following hemorrhage (HEM) in euhydrated (E) sheep. However, there is controversy whether hypertonic solutions would be effective in dehydrated (D) animals. Therefore, we used two groups (E and four days D) of chronically instrumented ewes to evaluate the responses to HSD following HEM. All sheep were bled and maintained at 50 mmHg mean arterial pressure (MAP) for two hours, then resuscitated with a 4 mL/kg bolus of HSD. Dehydration did not effect baseline MAP, heart rate (HR), or total peripheral resistance (TPR), whereas cardiac output (CO), stroke volume (SV), urine flow rate (V), and sodium excretion (U(sub Na)) were reduced and plasma sodium (P(sub Na)) and protein (PTP) were elevated. The only difference between groups during HEM were HR, SV, and TPR. Resuscitation with HSD restored MAP, CO, and TPR to baseline values. SV was increased above hemorrhage values but was not restored to baseline values in either group. HR increased further following HSD. P(sub Na) was raised 10 and 16 mEq/L in the E and D sheep, respectively, following HSD infusion, but no adverse effects associated with elevated P(sub Na) were observed in either group. Thus, HSD was effective in restoring MAP, CO, and TPR to baseline values in D sheep but it was at the expense of a lower SV and a higher HR than in E sheep. Author

Cardiac Output; Dehydration; Dextrans; Resuscitation; Stroke Volume

20010020366 Army Research Inst. of Environmental Medicine, Military Nutrition Div., Natick, MA USA

Effects of Choline Supplementation on Physical Performance

Warber, John P., Army Research Inst. of Environmental Medicine, USA; Patton, John F., Army Research Inst. of Environmental Medicine, USA; Tharion, William J., Army Research Inst. of Environmental Medicine, USA; Zeisel, Steven H., North Carolina Univ., USA; Mello, Robert P., Army Research Inst. of Environmental Medicine, USA; Kemnitz, Christopher P., Army Research Inst. of Environmental Medicine, USA; Liebeman, Harris R., Army Research Inst. of Environmental Medicine, USA; Metabolism; 2000; Volume 10, pp. 170-181; In English

Report No.(s): AD-A383555; Copyright; Avail: Defense Technical Information Center (DTIC)

It has been reported that plasma choline levels decrease following certain types of strenuous exercise. Preliminary findings also suggest that a drop in plasma choline may limit physical performance, while choline supplementation may delay fatigue during prolonged efforts. A double-blind crossover design was used to determine the relationship between plasma choline and performance during and after four hours of strenuous exercise. Volunteers (N=14) received either a placebo or treatment beverage (8.425 g choline citrate) prior to and midway through a four hour load carriage treadmill exercise (3% grade at 5.6 km/hr x 20 km) carrying a total load of 34.1 kg. Following the treadmill test, run time-to-exhaustion and squat tests were performed, and perceived exertion, plasma choline, glycerophosphocholine, and physphatidylcholine were measured. Plasma choline levels increased 128% after the run-to-exhaustion with the choline supplemented beverage but remained unchanged with the placebo beverage. No significant effects were seen with choline supplementation on any outcome performance measure. Consequently, soldiers conditioned to carry heavy loads over long distances do not deplete plasma choline as a result of a prolonged exhaustive exercise under a placebo beverage, nor do they benefit from choline supplementation to delay fatigue under the same conditions.
Author
Choline; Physical Exercise; Plasmas (Physics)

20010020409 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Effect of Indomethacin on Resistance to Endotoxin Shock ***Final Report***
Waymack, J. Paul; Moldawer, Lyle L.; Lowry, Stephen F.; Guzman, Ray F.; Okerberg, Carlin V.; Mason, Arthur D.; Pruitt, Basil A.; Surgical Research Communications; 1990; Volume 7, pp. 301-309; In English
Contract(s)/Grant(s): DA Proj. 3M1-61102-BS-14
Report No.(s): AD-A383616; Copyright; Avail: Defense Technical Information Center (DTIC)
There is conflicting data on the effect of indomethacin on resistance to sepsis, possibly due to its ability to affect multiple components of the immune system, including physiologic interactions. We examined the effect of indomethacin on resistance to endotoxin shock with special reference to the rate of tumor nectrosis factor (TNF) appearance. Seventy-five rats received either 1 ml saline or 4 mg/kg indomethacin every 12 hours commencing 12 hours prior to endotoxin challenge and continuing for two days. The mortality rates were 15% for the saline group and 46% for the indomethacin group. The mean survival times were 147.7 +/- 7.8 and 102.9 +/- 12.2 hours, respectively. Sixty additional rats received either saline or indomethacin at 12 hours and 1 hour prior to endotoxin challenge. Two hours after challenge, plasma was obtained for analysis of TNF levels. The TNF levels for the saline and indomethacin groups were 22.72 +/- 0.83 and 21.97 +/- 1.28 ng/ml. In conclusion, indomethacin appears to decrease resistance to endotoxin shock, but not through alteration in the rate of TNF appearance. Administration of indomethacin to septic patients in an attempt to improve function may result in endotoxin deaths.
Author
Endotoxins; Mortality; Survival; Tumors

20010020410 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Heterotopic Bone Formation in Burned Patients ***Final Report***
Elledge, E. Scott, Army Inst. of Surgical Research, USA; Smith, Anthony A., Army Inst. of Surgical Research, USA; McManus, William F., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Journal of Trauma; May 1988; ISSN 0022-5282; Volume 28, No. 5, pp. 684-687; In English
Contract(s)/Grant(s): DA Proj. 301-62787-A-874
Report No.(s): AD-A383614; Copyright; Avail: Defense Technical Information Center (DTIC)
Heterotopic bone formation about joints and in soft tissues is known to cause joint immobilization and permanent physical impairment in burn patients. Despite aggressive physical therapy aimed at prevention, heterotopic bone formation still occurs in a small percentage of patients. Prolonged immobilization in concert with trauma or burn about the involved joint is recognized as being responsible for this heterotopic bone formation. Specifically, immobilization of extremities, particularly the elbow and upper extremity, should be minimized by early grafting for preservation of functions. As burn therapy has enabled increasing numbers of patients to survive extensive burns, it is imperative that preservation of function not be ignored and that attention be directed at improved function early in the postburn course.
Author
Burns (Injuries); Immobilization; Therapy

20010020411 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Lymphocyte Phenotype amd Function Changes in Burn Patients After Intravenous IgG Therapy ***Final Report***
Burleson, David G., Army Inst. of Surgical Research, USA; Mason, Arthur D., Jr., Army Inst. of Surgical Research, USA; McManus, Albert T., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Archives of

Surgery; November 1988; Volume 123, No. 11, pp. 1379-1382; In English
Contract(s)/Grant(s): DA Proj. 301-62787-A-874
Report No.(s): AD-A383612; Copyright; Avail: Defense Technical Information Center (DTIC)

The effects of prophylactic administration of intravenous IgG on immune-cell phenotype and function in burn patients were compared with those of patients receiving standard therapy. Intravenous IgG infusions were given twice weekly for three weeks postburn or until wound closure. Intravenous IgG had no effect on the proportion of total T-lymphosctes, T-helper lymphocytes, or T-suppressor lymphocytes, but the proportion of B-lymphocytes decreased 40% in treated patient samples. Lymphocytes from treated patients incorporated less thymidine with stimulated with concanavalin A or pokeweed mitogen, but not with phytohemogglutinin. The amount of IgM secreted by pokeweed mitogen-stimulated cultures from treated patients increased by 24%, while the amount of IgG remained constant. The changes in beta-lymphocyte number and functional response may have been induced by the increased serum IgG levels in the intravenous IgG-treated patients.
Author
Intravenous Procedures; Lymphocytes; Patients; Serums; Wound Healing

20010020412 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Lymphoid Subpopulation Changes After Thermal Injury and Thermal Injury with Infection in an Experimental Model ***Final Report***
Burleson, David G., Army Inst. of Surgical Research, USA; Mason, Arthur D., Jr., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Annals of Surgery; February 1988; Volume 207, No. 2, pp. 208-212; In English
Contract(s)/Grant(s): DA Proj. 3M1-61102-BS-14
Report No.(s): AD-A383611; Copyright; Avail: Defense Technical Information Center (DTIC)

Subpopulation analysis of peripheral blood lymphoscytes is a frequently used measure of immunocompetence. Yet, little is known about the lymphocyte subpopulations in the circulation and lymphoid organs after severe trauma. Blood, spleen, and lymph node (LN) subpopulations were compared in a rat model of burn injury (B) and burn injury with infection (BI). B and BI rats received 30% total body surface scald burns. Infection was induced by seeding wounds with Pseudomonas aeruginosa. Subpopulations were identified by flow cytometry 48 hours after burn. Helper lympohscytes were selectively depleted from the circulation of BI but not B animals, which caused the ratio of helper to suppressor cells (HSR) in BI animals to decrease significantly compared with the unburned controls. Both LN helper and suppressor cells were decreased in BI animals and the HSR was unchanged, but a selective reduction in suppressor cells in B LN increased the HSR relative to unburned controls. Spleen subpopulations were unchanged for both B and BI groups. Subpopulation changes after trauma and infection were different for each tissue examined.
Author
Burns (Injuries); Infectious Diseases; Injuries

20010020413 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Cold Injury, Section 27 ***Final Report***
Goodwin, Cleon W., Jr., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Moore, Ernest E., Editor; Early Care of the Injured Patient; 1990, pp. 307-314; In English
Report No.(s): AD-A383589; Copyright; Avail: Defense Technical Information Center (DTIC)

Exposure to cold can produce a spectrum of physiologic derangements, varying from direct tissue damage to severe total body hypothermia. The injury produced by exposure to cold depends on how low the temperature is, how long the person is exposed, and whether other environmental conditions are present that can influence the effects of low temperature. Although it resembles heat injury in many ways, cold injury induces unique pathophysiologic alterations and requires a different therapeutic approach than heat injury. Always a concern in military populations, cold injuries are now seen with increasing frequency as the popularity of winter sports increases and as the numbers of elderly and homeless persons in the population grow.
Author
Exposure; Hypothermia; Injuries; Low Temperature; Temperature Effects

20010020430 Colorado Univ., Health Center, Denver, CO USA
Mechanisms of Virus-Induced Neural Cell Death ***Annual Report, 15 Aug. 1999 - 14 Aug. 2000***
Tyler, Kenneth L., Colorado Univ., USA; September 2000; 112p; In English
Contract(s)/Grant(s): DAMD17-98-1-8614
Report No.(s): AD-A384857; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

We are using post-mortem and brain-biopsy derived material from patients with herpes simplex and varicella zolster virus encephalitis to identify the presence of apoptotic cells in the CNS and their correlation with viral infection and tissue injury. We are also using reovirus infection as a model to study cellular mechanisms of virus-induced cell death. Reovirus infection is associated with the activation of the nuclear transcription factor NF-kappa-B, and inhibition of this activation inhibits apoptosis. There is increased expression of the apoptosis inducing ligand TRAIL in reovirus-infected cells. Inhibition of TRAIL binding to its cell surface death receptors, DR4 and DR5, inhibits reovirus-induced apoptosis. mRNA levels of TRAIL and DR4 are increased in reovirus-infected cells, as are levels of mature DR5 protein. Reovirus infection is associated with activation of apoptosis-associated proteases including calpain and caspases. Caspase activation involves the death-receptor associated and the mitochondrial-associated apoptotic pathways. Inhibition of either calpain or caspase activation inhibits reovirus-induced apoptosis in vitro. In a murine model of reovirus-induced myocarditis, inhibition of calpain activation prevents apoptotic myocraidal injury. This suggests that inhibition of apoptosis may be a novel strategy for anti-viral therapy. Reovirus-induced apoptosis and cell cycle dysregulation are both determined by the viral S1 gene. Reoviruses induce a G2M cell cycle arrest. The S1-encoded sigma-1s progein is necessary for this process, but is not essential for apoptosis. Reovirus-induced apoptosis can be inhibited without preventing G2M cell cycle arrest, indicating that apoptosis-associated DNA damage does not cause reovirus-induced cells cycle arrest.
Author

Antiinfectives and Antibacterials; Apoptosis; Viruses

20010020453 Fox Chase Cancer Center, Philadelphia, PA USA

Targeting Breast Cancer With Anti HER2/neu Diabodies ***Annual Report, 22 Jun. 1998 - 21 Jun. 1999***

Weiner, Louis M., Fox Chase Cancer Center, USA; July 1999; 9p; In English

Contract(s)/Grant(s): DAMD17-98-1-8307

Report No.(s): AD-A383948; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

The objective of this proposal is to develop new therapeutic reagents for breast cancer. It is our hypothesis that improved diabody-based molecules with affinity for HER2/neu can be engineered and will prove to be effective vehicles for the RIT of breast cancer. The first Technical Objective (TO) has focused on optimization of the production of the selected diabody and the identification of the optimal radionuclide and labelling strategy for diabody-based RIT. This TO has involved an investigation into the impact on diabody targeting and RIT of a variety of factors likely to be encountered in a clinical setting. These include the degree of antigen density, the route (i.v. bolus or continuous infusion) and frequency of administration, the presence of disseminated disease, and the effect of antigen expression on normal tissues. These experiments have set the stage for proceeding to the clinical evaluation of diabody-based targeting of breast cancer in our second Technical Objective. The clinical component of this proposal will entail a Phase I radioimmunoimaging and radioimmunoguided surgery trial designed to elicit information on the dosimetry, specificity, and tumor penetration properties of radiolabled C6.5 diabody, and will assess the RIT potential of this molecule.
Author

Antigens; Cancer; Mammary Glands; Reagents; Therapy; Medical Science

20010020523 Anser Analytic Services, Inc., Arlington, VA USA

Ensuring Radiation Safety for Mars-Bound Astronauts

Turner, R. E., Anser Analytic Services, Inc., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 298-299; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Human expeditions to Mars will be the most ambitious space missions of our time. to execute these missions successfully, the radiation environment must be understood and risks appropriately managed from a systems perspective. Mars exploration missions from 2001 through the next twenty years present exciting and unique opportunities for advances in radiation risk management of a future human mission to Mars. A major Human Exploration and Development of Space (HEDS) objective is to characterize the Martian radiation environment. In addition, the Mars mission cruise phases provide multipoint observations of SPEs in the critical region of the heliosphere (1 to 1.5 AU) needed to reduce the in-flight radiation risk to a future Mars-bound crew. to enable the incorporation of appropriate instrumentation, it is critical that the Mars exploration roadmap continue to recognize the importance of energetic particle detectors and radiation monitors on landers, orbiters, and during the cruise phase.
Author

Mars Environment; Mars Exploration; Mars Missions; Radiation Protection; Mars Surface Samples

20010020761 NASA Ames Research Center, Moffett Field, CA USA

Dose Response Effects of Hypertonic Saline and Dextran on Cardiovascular Responses and Plasma Volume Expansion in Sheep ***Final Report***

Dubick, Michael A., Letterman Army Inst. of Research, USA; Davis, Jessica M., California Univ., USA; Myers, Tamara, Texas Univ., USA; Wade, Charles E., NASA Ames Research Center, USA; Kramer, George C., Texas Univ., USA; Shock; February 1995; Volume 3, No. 2, pp. 137-144; In English

Contract(s)/Grant(s): DA Proj. 3S4-64807-D-832

Report No.(s): AD-A383553; DA-314428; Copyright Waived; Avail: Defense Technical Information Center (DTIC)

Despite the established efficacy of 7.5% NaCl/6% dextran-70 in the treatment of hypovolemia, the optimal formulation of a hypersomeotic/hyperoncotic small volume resuscitation solution has yet to be defined. The present study investigates the cardiovascular effects of hypertonic saline ranging from 3.75 to 25% NaCl (HS) and dextran-70 (D-70) ranging from 3 to 24%. HS and D-70 were studied alone or in specific combinations at a dose of 4 mL/kg, in euvolmeic sheep. Blood samples were collected before, during, and up to 60 minutes after infusion of the test solutions. Dose-dependent effects of HS were immediate increases in cardiac output (CO) of 30-85%, falling to 10-35% over baseline after 60 minutes. HS concentrations over 3.75% significantly reduced systemic vascular resistance, but HS had no significant effect on mean arterial pressure (MAP). Plasma volume (PV) expansion with HS was an immediate, but transient increase of 12-35%. Infusion of D-70 induced sustained 10-20% increases in CO and 10-30% increases in PV, peaking ten minutes post-infusion. D-70 also resulted in small (5-12 mmHg) increases in MAP. Cardiovascular effects of D-70 correlated with a dose-dependent increase in plasma dextran concentrations. All HS solutions significantly increased plasma Na, which peaked at is greater than = 200 mEq/L in the 25% group. The effects of D-70 and HS combined were additive on PV expansion and CO. These data indicate that concentrations of HS and D-70 which are higher than those currently used have a greater capability of expanding PV, but use of HS 7.5% may be limited by resulting hypermatremia.
Author

Dextrans; Dosage; Cardiovascular System; Hypovolemia; Physiological Responses

20010020799 National Inst. of Health, National Inst. of Diabetes and Digestive and Kidney Diseases, Bethesda, MD USA

Research Needs in Pediatric Kidney Disease, 2000 and Beyond. Pediatric Nephrology Task Force Meeting

June 2000; 52p; In English, 27 Jan. 1999, Washington, DC, USA

Report No.(s): PB2001-101528; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

Kidney disease is a major cause of illness and death among children, who make up about 25% of US citizens. About 5,000 children who have kidney disease are on dialysis or have a kidney transplant because of end-stage renal disease, which is also called ESRD and kidney failure. Each year, 20,000 babies are born with kidney problems, 2,000 will die, and 1,000 will begin treatment for kidney failure.
Author

Children; Kidney Diseases; Medical Science

20010020801 Brigham and Women's Hospital, Boston, MA USA

Validation of Quality Measures for Hip Replacement. Abstract, Executive Summary and Final Report

Katz, Jeffrey N., Brigham and Women's Hospital, USA; [2000]; 36p; In English

Contract(s)/Grant(s): HS009775

Report No.(s): PB2001-101438; AHRQ-2001-02; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The principal aims of this project were to validate indicators of the quality of elective total hip replacement (THR) and to develop a cumulative index of indicators of the quality of THR. A panel of clinical and quality improvement experts recommended potential indicators of the quality of THR. We validated these indicators empirically in a population-based sample of 5211 Medicare beneficiaries who had primary THR in 171 randomly selected hospitals in three states. In univariate analyses, urban, private, and teaching hospitals, and hospitals with laminar airflow in the operating room and dedicated orthopedic units had higher rates of dislocation or infection within 90 days of surgery. In multivariate analyses, these variables explained some of the influence of volume, while surgeon volume virtually eliminated the hospital volume effect. We created a cumulative index comprised of three of these indicators. Hospitals with none of these characteristics had adverse orthopedic event rates of 5.4%, while hospitals with all three had event rates of just 1.3%. Our findings (which are still preliminary) suggest that hospital characteristics are associated with outcome, and have cumulative effect, but do not fully explain the strong influence upon outcome of hospital and surgeon case volume.
Author

Multivariate Statistical Analysis; Orthopedics; Quality Control; Medical Science

20010020845 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

The Effects of Chlordane Exposure during Pre-and Postnatal Periods at Environmentally Relevant Levels on Sex Steroid-Mediated Behaviors and Functions in the Rat ***Final Report***

Cassidy, Richard A., Army Inst. of Surgical Research, USA; Vorhees, Charles V., Children's Hospital, USA; Minnema, Daniel J., Hazelton Lab., USA; Hastings, Lloyd, Cincinnati Univ., USA; Toxicology and Applied Pharmacology; January 1994; ISSN 0041-008X; Volume 126, pp. 326-337; In English

Contract(s)/Grant(s): DA Proj. 3M1-61102-BS-14

Report No.(s): AD-A383504; Copyright; Avail: Defense Technical Information Center (DTIC)

Technical chlordane is a mixture of four main isomers (i.e., heptachlor, cis-chlordane, trans-chlordane, and trans-nonachlor) found in meat and dairy products as well as in indoor air of houses treated for termites. These isomers are metabolized to more potent epoxides (heptachlor epoxide and oxychlordane) which accumulate in lipid compartments of tissues and have been shown to reduce chloride influx through GABA (sub A) receptor complex channels and to alter steroid levels. However, considering the almost universal human exposure and the potential for accumulation of these agents, very little is known about how chronic, low-level exposures during development affect adult behavior and steroid-mediated processes. Time-pregnant Sprague-Dawley dams (Day 4 of gestation through Day 21 of lactation) and offspring (Day 22 of age through Day 80) were exposed to three levels of technical chlordane (100, 500, or 5000 ng/g) on a daily schedule. The low-exposure level generated heptachlor epoxide and oxychlordane plasma levels in the dam (Day 20) and in the offspring (Day 80) representative of those found in the U.S. populace. Chlordane-dosed offspring exhibited sex- and dose-dependent effects on testosterone levels, behavioral tests, and body weight conducted between postnatal Days 77 and 85. Chlordane-dosed females, but not males, had significant decreases in testosterone levels, significant improvements in spatial abilities (i.e., decreases in Cincinnati maze errors, navigation times, and failures to escape), and significant increases in body weight and in auditory startle-evoked responses. In two other tests, only males were used. These chlordane-dosed males showed significant increases in male-typical mating behaviors and decreases in CL-36 (-) uptake into brain microsacs. For all behavioral and body weight measurements, dose-response effects were observed for the 100 and 500 ng/g dosed groups. However, the 5000 ng/g dose group responses were closer to those of control values. These results suggest that these cyclodienes masculinize sexually dimorphic functions and behaviors by mimicking sex steroids and/or changing their levels.

DTIC

Rats; Steroids; Sex; Exposure; Birth; Chemical Effects; Insecticides

20010020846 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Progress in Burn Care: Introduction ***Final Report***

Pruitt, Basil A., Jr., Editor, Army Inst. of Surgical Research, USA; World Journal of Surgery; 1992; Volume 16, No. 1, pp. 1; In English

Contract(s)/Grant(s): DA Proj. 301-62787-A-874

Report No.(s): AD-A383494; Copyright; Avail: Defense Technical Information Center (DTIC)

Improved organization of burn care with the concentration of seriously burned patients at burn centers where the necessary multidisciplinary care can be provided, newly developed technology can be expediously applied, and properly stratified and controlled studies can be carried out, has resulted in further extension of the improved survival of burn patients reported in the World Progress in Surgery Burn Symposium in 1978.

DTIC

Burns (Injuries); Surgery; Patients; Pneumonia

20010020847 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

The Risk of Pneumonia in Thermally Injured Patients Requiring Ventilatory Support ***Final Report***

Rue, William W., III, Army Inst. of Surgical Research, USA; Cioffi, William G., Army Inst. of Surgical Research, USA; Mason, Arthur D., Jr., Army Inst. of Surgical Research, USA; McManus, William F., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Journal of Burn Care and Rehabilitation; May/June 1995; Volume 16, No. 3, pp. 262-268; In English; 24th, 1-4 Apr. 1992, Salt Lake City, UT, USA; Sponsored by American Burn Association, USA

Contract(s)/Grant(s): DA Proj. 3M1-62787A-874

Report No.(s): AD-A383496; Copyright; Avail: Defense Technical Information Center (DTIC)

The risk of pulmonary infectious complications in critically ill patients requiring ventilatory support is well established. Te evaluate the impact of tracheal intubation on the risk of pneumonia, the records of three hundred seventy thermally injured patients (mean age, 37.6 years, mean total body surface area burn, 44.7%) who were admitted during a 6-year interval and required ventilatory support were reviewed. The mean duration of intubation in these patients was 16.6 days, the incidence of pneumonia was

50%, and observed mortality was 37% (137 patients). Though they were significantly older (42.7 vs. 35.6 years, p=0.005) and had a higher frequency of pneumonia (60%vs. 46%, p=0.015) than the 265 patients with inhalation injury, the 105 patients without documented inhalation injury had mean burn size (41.9% vs. 45.9 %), length of intubation (18.9 vs. 15.7 days), postburn day of pneumonia (12.7 vs. 10.5 days), and mortality (38.1% vs. 36.6%) similar to that group. Actuarial life table analysis considering only pneumonia acquired during ventilatory support was used to evaluate the relation between the risk of pneumonia had the duration of ventilatory support. In this cohort of patients with burns, no difference in the risk of pneumonia was observed between patients with and without inhalation injury who required ventilatory support; the hazard of pneumonia was relatively constant during the first 6 weeks of intubation and was similar for all who underwent ventilation.
DTIC
Burns (Injuries); Patients; Pneumonia; Ventilation; Life Support Systems

20010020848 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Thermal Injuries ***Final Report***
Yowler, Charles J., Army Inst. of Surgical Research, USA; McManus, William F., Army Inst. of Surgical Research, USA; Current Opinion in Critical Care; 1995; ISSN 1070-5295; Volume 1, pp. 286-289; In English
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383492; Copyright; Avail: Defense Technical Information Center (DTIC)

Advances in burn resuscitation and treatment of the burn wound have resulted in marked improvements in survival from thermal injury. Pneumonia, often in the patient with preexisting inhalation injury, is now the leading cause of burn mortality. Advances in respiratory support, such as high-frequency ventilation, appear to decrease the frequency of pneumonia and thus increase survival in patients with inhalation injury. Wound coverage of large burns remains a challenge. Cultured autologous keratinocytes can provide temporary coverage in patients with massive burns but have been disappointing in terms of definitive permanent wound closure. Growth hormone appears to accelerate donor site healing and decrease hospital stay in patients with massive burns. Manipulation of the hypermetabolic response by the use of growth hormone and insulin-like growth factor-1 holds promise for possible improvements in burn care.
DTIC
Burns (Injuries); Respiration; Resuscitation; Ventilators; Pneumonia

20010020849 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
The Interaction of Burn Injury and Zinc Nutriture as Assessed by the Humoral Response to Sheep Red Blood Cells in a Burn Rat Model ***Final Report***
Shippee, R. L., Army Inst. of Surgical Research, USA; Kopenheffer, T., Army Inst. of Surgical Research, USA; Watiwat, S. R., Army Inst. of Surgical Research, USA; Burleson, D. G., Army Inst. of Surgical Research, USA; Mason, A. D., Jr., Army Inst. of Surgical Research, USA; Burns; 1992; ISSN 0305-4179; Volume 18, No. 1, pp. 45-48; In English
Contract(s)/Grant(s): DA Proj. 3M1-61102-BS-14
Report No.(s): AD-A383490; Copyright; Avail: Defense Technical Information Center (DTIC)

Clinical and animal studies suggest that burn injury induces alterations in zinc metabolism. It also has been established that zinc nutriture can cause alterations in the immune response, but there is a paucity if information concerning the interrelationship between burn injury, zinc nutriture and the immune response. In the present study, rats were subjected to full skin thickness dorsal scald injuries covering 30 percent of the total body surface and then maintained on sufficient or deficient zinc intake. The rats were immunized with sheep blood cells (SRBC) on day 6 postburn and killed 4 days later. The spleens were excised and spleen lymphocytes isolated and used in a Jerne plaque assay to determine the number of plaque-forming cells (PFC). The burn/zinc-sufficient regimen significantly increased (P less than 0.01) the PFC response when compared to unburned zinc-sufficient or zinc-deficient control rats. Burned rats that were maintained on a zinc-deficient regimen showed a significant decrease (P less than 0.05) in PFC when compared to burned rats maintained on a zinc-sufficient regimen. This study indicates an interaction of zinc in the primary humoral immune response following thermal injury.
DTIC
Burns (Injuries); Cells (Biology); Erythrocytes; Metabolism; Rats; Zinc; Immune Systems

20010020850 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Control of Pseudomonas Aeruginosa Infections in Burned Patients
McManus, Albert T., Army Inst. of Surgical Research, USA; Mason, Arthur D., Jr., Army Inst. of Surgical Research, USA; McManus, William F., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Surgical Research Communications; 1992; Volume 12, pp. 61-67; In English

Contract(s)/Grant(s): DA Proj. 301-62787-A-874
Report No.(s): AD-A383488; Copyright; Avail: Defense Technical Information Center (DTIC)

The incidence and postburn day (PD) of the occurrence of Pseudomonas aeruginosa colonization and infections were reviewed for 2316 burn patients admitted either into an open ward (OICU) (1984-1990) intensive care environment. Patients admitted into the IICU had the same incidence of PA colonization, but at a significantly delayed mean PBD (25 vs 15 P less than 0.001). Pseudomonas bacteremia, pneumonia and invasive burn wound infection each occurred in patients treated in the IICU at a significantly reduced frequency (P less than 0.001) and at a later PBD (P less than 0.01). A predictor of expected mortality based on multiple logistic regression of mortality, age and burn size of noninfected patients in the same time period was used to estimate the possible effects of PA infection on mortality. PA infection significantly increased the mortality (P less than 0.01) in the OICU, but not in patients treated in the IICU during the latter period of the study. The enhancement of infection control practices by single bed isolation of seriously burned patients appears to have reduced the clinical significance of this traditional burn pathogen.
DTIC

Burns (Injuries); Infectious Diseases; Patients; Pseudomonas; Pathogenesis

20010020852 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Diagnosis and Treatment of Inhalation Injuries ***Final Report***

Cioffi, William G., Jr., Army Inst. of Surgical Research, USA; Rue, Loring W., III, Army Inst. of Surgical Research, USA; Critical Care of North America; June 1991; ISSN 0899-5885; Volume 3, No. 2, pp. 191-198; In English
Contract(s)/Grant(s): DA Proj. 301-62787-A-874
Report No.(s): AD-A383486; Copyright; Avail: Defense Technical Information Center (DTIC)

Inhalation injury is a frequent and often lethal concomitant injury in the thermally injured patient. The typical inhalation injury is, in reality, a chemical tracheobronchitis caused by the inhalation of the products of incomplete combustion. True thermal injury below the vocal cords is infrequent but may occur as a consequence of the inhalation of steam, which may contain as much as 4000 times the amount of heat contained in dry air. Although many advances have been made in fluid resuscitation, metabolic support, and wound management which have increased survival following thermal injury, little progress has been made in the care of the patient with inhalation injury.
DTIC

Diagnosis; Respiration; Burns (Injuries); Pulmonary Functions; Clinical Medicine; Human Pathology; Physiology

20010020853 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Burn Wound Infections: Current Status ***Final Report***

Pruitt, Basil A., Jr., Texas Univ. Health Science Center, USA; McManus, Albert T., Army Inst. of Surgical Research, USA; Kim, Seung H., Army Inst. of Surgical Research, USA; Goodwin, Cleon W., Army Inst. of Surgical Research, USA; World Journal of Surgery; February 1998; Volume 22, pp. 135-145; In English
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383485; Copyright; Avail: Defense Technical Information Center (DTIC)

The burn wound represents a susceptible site for opportunistic colonization by organisms of endogenous and exogenous origin. Patient factors such as age, extent of injury, and depth of burn in combination with microbial factors such as type and number of organisms, enzyme and toxin production, and motility determine the likelihood of invasive burn wound infection. Burn wound infections can be classified on the basis of the causative organism, the depth of invasion, and the tissue response. Diagnostic procedures and therapy must be based on an understanding of the pathophysiology of the burn wound and the pathogenesis of the various forms of burn wound infection. The time-related changes in the predominant flora of the burn wound from gram-positive to gram-negative recapitulate the history of burn wound infection. Proper clinical and culture surveillance of the burn wound permits early diagnosis of gram-positive cellulitis, and the stable susceptibility of Beta-hemolytic streptococci to penicillin had eliminated the threat of this once common burn wound pathogen. Selection and dissemination of intrinsic and acquired resistance mechanisms increase the probability of burn wound colonization by resistant species such as Pseudomonas aeruginosa. Even so, effective topical antimicrobial chemotherapy and early burn wound excision have significantly reduced the overall occurrence of invasive burn wound infections. Individual patients, usually those with extensive burns in whom wound closure is difficult to achieve, may still develop a variety of bacterial and nonbacterial burn wound infections. Consequently, the entirety of the burn wound must be examined on a daily basis by the attending surgeon. Any change in wound appearance, with or without associated clinical changes, should be evaluated by biopsy. Quantitative cultures of the biopsy sample may identify predominant organisms but are not useful

for making the diagnosis of invasive burn wound infection. Histolic examination of the biopsy specimen, which permits staging the invasive process, is the only reliable means of differentiating wound colonization from invasive infection.
DTIC
Burns (Injuries); Infectious Diseases; Pathogenesis; Culture Techniques

20010020854 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Thermal Injuries, Chapter 34
Harrington, David T., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Surgical Care for the Elderly; 1998, pp. 439-455; In English
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383483; Copyright; Avail: Defense Technical Information Center (DTIC)

Who are the elderly? Retirement often begins at 60 years of age and Medicare eligibility usually begins at 62 years of age. When this chapter was written for the first edition, the elderly were defined as patients who were greater than 50 years old. As this group ages, yet remains an active and vital part of the community, this breakpoint of 50 appears dated. However, when one examines the mortality for any given burn size, burn mortality begins to increase dramatically in the fifth decade. Our definition of elderly as greater than 50 years old, therefore, reflects not an arbitrary cutoff, but an age that we and many authors have found an effect of age on mortality statistics. The population of the USA is aging. In 1985, approximately 11.5% of the U.S. population was greater than 65 years old, by 2025 this number is projected to be 20%. Death rates at all ages are decreasing, most dramatically in the ”old, old,” the population aged greater than 80. This group is the fastest growing segment of the population. Their numbers should double by the year 2000. This demographic change poses tremendous challenges politically, socially, and medically.
DTIC
Age Factor; Burns (Injuries); USA; Patients

20010020855 Army Research Inst. of Environmental Medicine, Natick, MA USA
Immune Deficits Induced by Strenuous Exertion Under Adverse Environmental Conditions: Manifestations and Countermeasures
Shephard, Roy J., Defence and Civil Inst. of Environmental Medicine, Canada; Castellani, John W., Army Research Inst. of Environmental Medicine, USA; Shek, Pang N., Defence and Civil Inst. of Environmental Medicine, Canada; Critical Revie ws(tm) in Immunology; 1998; Volume 18, pp. 545-568; In English; Sponsored in part by Canadian Tire Acceptance Ltd.
Report No.(s): AD-A383634; Copyright; Avail: Defense Technical Information Center (DTIC)

A brief description is given of the various laboratory and clinical manifestations of immune suppression that arise when strenuous exertion must be carried out in the face of a negative energy balance, shifts of circadian rhythm, sleep deprivation, psychological stressors, and exposure to hostile environments (extremes of heat or cold, high or low ambient pressures, and hyper- or hypo-gravity conditions). From the operational viewpoint, immune suppression could impair both physical and mental performance by increasing susceptibility to opportunistic microorganisms. It is also likely to increase susceptibility to sepsis following trauma or extensive burns, and has occassionally predisposed to fatal myocarditis. The effects of such challenges are complex, in part because of interactions, between the various stressors. It is thus important to investigate the impact and ot devise appropriate countermeasures with the full physical and intellectual resources of a defense environmental research laboratory. Existing knowledge of the topic is reviewed, and suggestions are made for research that may lead to new and more effective countermeasures.
DTIC
Immune Systems; Physical Work; Human Factors Engineering; Man Environment Interactions; Psychological Factors

20010020856 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Neurodocrine and Sympathoadrenal Response to Thermal Trauma
Vaughan, George A., Army Inst. of Surgical Research, USA; 1990; 40p; In English
Contract(s)/Grant(s): DA Proj. 301-62787-A-874
Report No.(s): AD-A383618; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The previous chapters have described many alterations in secreted hormones and metabolic processes that occur for weeks to months after major burn injury. Interpretation of these alterations can be bewildering; however, many of the findings can be simplified and/or unified to a certain extent if they are viewed as part of an overall alteration in central nervous system (CNS) function characterized by modified control settings.
DTIC
Adrenal Gland; Burns (Injuries); Central Nervous System; Sympathetic Nervous System; Endocrine Systems; Physiological Responses

20010020864 Army Inst. of Surgical Research, Microbiology Branch, Fort Sam Houston, TX USA

Infections of Burn Wounds, Chapter 38 ***Final Report***

Mozingo, David W., Florida Univ., USA; McManus, Albert T., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Texas Univ. Health Science Center, USA; Hospital Infections; 1998, pp. 587-597; In English

Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874

Report No.(s): AD-A383482; Copyright; Avail: Defense Technical Information Center (DTIC)

Infection, the risk of which is proportional to the extent of the injury, continues to be the predominant determinant of outcome in thermally injured patients despite improvements in overall care in general and wound care in particular. The control of invasive burn would infection through the use of effective topical chemotherapy, prompt surgical excision, and timely closure of the burn wound has resulted in unsurpassed survival rates. Even so, infection remains the most common cause of death in these severely injured patients.

Author

Burns (Injuries); Infectious Diseases; Survival

20010020865 Army Inst. of Surgical Research, Mechanical Trauma Research Branch, Fort Sam Houston, TX USA

Effects of Acetaldehyde Administration on Tissue Trace Elements and Superoxide Dismutase Activity in Rats ***Final Report***

Dubick, Michael A., Army Inst. of Surgical Research, USA; Keen, Carl L., California Univ., USA; Environmental and Nutritional Interactions; 1997; ISSN 1086-5683; Volume 1, pp. 161-169; In English

Contract(s)/Grant(s): DA Proj. 3A1-61101-A-91-C

Report No.(s): AD-A383444; Copyright; Avail: Defense Technical Information Center (DTIC)

Acetaldehyde is a known toxicant associated with alcohol intake and cigarette smoking. It has been suggested that ethanol-induced oxygen radical generation and the resultant tissue injury often associated with it may be mediated by acetaldehyde. to investigate this hypothesis, the present study examined tissue trace element (TE) concentrations and superoxide dismutase (SOD) activity in adult rats after a 14-day administration of acetaldehyde or saline via osmotic minipumps. Acetaldehyde-treated rats had 73% higher serum Cu concentrations, and significantly higher liver, kidney, heart, and brain Zn concentrations and higher liver, heart, and brain Mg levels than controls. Cluster analysis of the TE concentrations revealed significant differences in TE relationships between the two groups. In addition, Mn-SOD and CuZn-SOD activity was 16 and 22% higher, respectively, in liver from acetaldehyde-treated rats than in controls. In lung, acetaldehyde treatment resulted in significantly higher CuZn-SOD but lower MnSOD activity compared with controls. TE metabolism is indirectly related to antioxidant status, and alterations in Cu, Zn, and Mg metabolism have been associated with the initialization and progression of numerous disease states.

Author

Acetaldehyde; Cluster Analysis; Antioxidants; Damage

20010020866 Army Research Inst. of Environmental Medicine, Thermal and Mountain Medicine Div., Natick, MA USA

Slower Fatigue and Faster Recovery of the Adductor Pollicis Muscle in Women Matched For Strength With Men

Fulco, C. S., Army Research Inst. of Environmental Medicine, USA; Rock, P. B., Army Research Inst. of Environmental Medicine, USA; Muza, S. R., Army Research Inst. of Environmental Medicine, USA; Lammi, E., Army Research Inst. of Environmental Medicine, USA; Cymerman, A., Army Research Inst. of Environmental Medicine, USA; Butterfield, G., Veterans Administration Medical Center, USA; Moore, L. G., Colorado Univ., USA; Braun, B., Veterans Administration Medical Center, USA; Lewis, S. F., Boston Univ., USA; Acta Physical Scand; 1999; Volume 167, pp. 233-239; In English

Contract(s)/Grant(s): DAMD17-94-BAA

Report No.(s): AD-A383448; Copyright; Avail: Defense Technical Information Center (DTIC)

In previous gender comparisons of muscle performance, men and women rarely have been closely matched, absolute force has not been equalized, and rates of fatigue and early recovery have not been determined. We compared adductor pollicis muscle performance at a similar absolute force development in healthy men and women (both n = 9) matched for adductor pollicis maximal voluntary contraction (MVC) force. Subjects repeated static contractions at a target force of approximately 50% of MVC force of rested muscle for five seconds followed by a five second rest until exhaustion, i.e., inability to maintain the target force for five seconds. MVC force was measured following each minute of exercise, at exhaustion, and after each minute for three minutes of passive recovery. For women compared to men: MVC force fell less after one minute of exercise; MVC force fell approximately two-fold slower; and endurance time to exhaustion was nearly two times longer. After declining to a similar level of MVC force of rested muscle at exhaustion, MVC force rose faster in women than in men during the first minute of recovery. The findings

are consistent with the hypothesis that slower adductor pollicis muscle fatigue in women is linked with differences between men and women both in impairment of force generating capacity, per se, and in rates of recovery between contractions.
Author
Contraction; Muscular Function; Physical Exercise; Muscular Fatigue; Muscular Strength

20010020867 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Etiology and Prevention of Infection Following Thermal Injury, Chapter 17 ***Final Report***
Shirani, Khan Z., Army Inst. of Surgical Research, USA; Vaughan, George M., Army Inst. of Surgical Research, USA; McManus, Albert T., Army Inst. of Surgical Research, USA; Mason, Arthur D., Jr., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Texas Univ. Health Science Center, USA; Intravenous Immunoglobulins in Clinical Practice; 1997, pp. 225-241; In English
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383472; LC-97-25515; ISBN 0-8247-9881-3; Copyright; Avail: Defense Technical Information Center (DTIC)

The risk of nosocomial infection in the burned patient is proportional to the extent of injury. Local and systemic factors may promote such a relationship. Loss of the protective skin barrier and the need for invasive monitoring provide endogenous bacterial opportune access to the vulnerable tissues of the body and predispose the burned host to systemic infection. Though laboratory results suggest global immunosuppression in the immediate postburn period, infectious complications are usually delayed to the second week postburn or beyond in patients treated with current techniques. Progressive improvements in general patient care, fluid therapy of shock, wound management, patient isolation techniques, and effective management of pulmonary and other septic complications have significantly improved burn patient survival in recent decades. However, despite the recent improvements in burn patient management, infection remains the major cause of morbidity and mortality following extensive injury. In this chapter we review some of the pertinent causes of increased susceptibility of a burn.
Author
Infectious Diseases; Burns (Injuries); Mortality; Survival; Therapy

20010020868 Walter Reed Army Medical Center, Dept. of Virus Diseases, Washington, DC USA
Molecular Characterization of a Hepatitis E Virus Isolate From Nambia
He, Junkun, Walter Reed Army Medical Center, USA; Binn, Leonard N., Walter Reed Army Medical Center, USA; Tsarev, Sergei, Walter Reed Army Medical Center, USA; Hayes, Curtis G., Naval Medical Research Center, USA; Frean, John A., South Africa Inst. for Medical Research, South Africa; Isaacson, Margaretha, South Africa Inst. for Medical Research, South Africa; Innis, Bruce L., Walter Reed Army Medical Center, USA; Journal of Biomedical Science; 2000; Volume 7, pp. 334-338; In English; Sponsored in part by SmithKlineBeecham Biologicals
Report No.(s): AD-A383474; Copyright; Avail: Defense Technical Information Center (DTIC)

Hepatitis E virus (HEV) causes sporadic and epidemic acute viral hepatitis in many developing countries. In Africa, hepatitis E has been documented by virus detection in Egypt, Chad, Algeria, Morocco, and Tunisia. Cases of presumptive hepatitis E also have been documented by detection of antibody to HEV in the Sudan, Kenya, Ethiopia, Somalia, Djibouti, and South Africa. Recently, we reported the recovery of nine isolates of HEV from feces collected during an outbreak of jaundice in Namibia. These specimens were stored frozen for many years at the South African Institute for Medical Research awaiting for new methods to determine the etiology of jaundice. HEV genomic sequences were detected by antigen-capture RT-PCR with primers that amplified two independent regions of the HEV genome (ORF-2 and ORF-3). to further characterize the HEV 83-Namibia isolates, we determined the nucleotide (nt) sequence of the 3' end of the capsid gene and ORF-3 for one isolate. The capsid gene sequence sequence shared 86% identity with the prototype Burma strain and up to 96% identity with other African strains at the (nt) level, and 99% identity with Burma or other Africa strains at the amino acid level. A 188 (nt) fragment amplified from ORF-3 was also high homologous to the other HEV but was too short for meaningful comparison. Phylogenetic analysis indicated that HEV 83-Namibia is closely related to other African isolates, and differs from Burmese, Mexican, and Chinese HEV. These data link the HEV causing the 1983 Namibia outbreak to more recent HEV transmission in North and sub-Saharan Africa, suggesting this sub-genotype of HEV is firmly established throughout the continent.
Author
Hepatitis; Medical Science; Viruses

20010020869 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Incidence of Bacteremia After Burn Wound Manipulation in the Early Postburn Period ***Final Report***
Mozingo, David W.; McManus, Albert T.; Kim, Seung H.; Pruitt, Basil A.; Journal of Trauma Injury, Infection and Clinical Care; June 1997; ISSN 1079-6061; Volume 42, No. 6, pp. 1006-1011; In English; 56th, 19-21 Sep. 1996, Houston, TX, USA; Sponsored

by American Association for the Surgery of Trauma, USA
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383475; Copyright; Avail: Defense Technical Information Center (DTIC)

Transient bacteremia associated with burn wound manipulation is considered a frequent occurrence and is commonly cited as an indication for perioperative antibiotic prophylaxis in burn patients. In a prospective clinical setting, blood cultures (BC) were obtained from 19 burn patients at the following intervals: (1) 30 minutes after wound cleansing (WC) or wound excision (WE); (2) 30 minutes after the start of WC or WE; (3) hourly until procedure completion, and (4) one hour after completion. Burn wound biopsy for histologic grading and microbial culture was performed after the first BC. Twenty-two WC and 20 WE episodes were evaluated by 67 and 76 BC sets, respectively. Patients had a mean age of 42.8 years and a burn size of 50% of body surface area. Three WC episodes (12.6%) and four WE procedures (20.0%) were associated with postprocedure bacteremia. Two patients had both preprocedure and postprocedure bacteremia later attributed to nonburn wound infections. Excluding these cases, the bacteremia rate was 12.5% (9.5% from WC and 15% from WE). Wound biopsy culture and histologic analysis did not predict the occurrence of bacteremia. Current therapy is associated with a lesser incidence of burn would manipulation-induced bacteremia than reported in prior series. The discordance between would biopsy and BC results, the absence of positive histology, and the similarity of bacteremia occurrence rates with WC and WE confirm the effectiveness of current techniques of microbial control in the burn wounds and question the need for perioperative antibiotic therapy in patients with burns involving less than 40% of the total body surface during the first ten postburn days.

Author

Burns (Injuries); Histology; Infectious Diseases; Therapy

20010020870 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Management of the Burn Wound ***Final Report***

Jordan, Byron S., Army Inst. of Surgical Research, USA; Harrington, David T., Army Inst. of Surgical Research, USA; Nursing Clinics of North America; June 1997; ISSN 0029-6465; Volume 32, No. 2, pp. 251-273; In English
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383476; Copyright; Avail: Defense Technical Information Center (DTIC)

Since 1950, there has been sustained improvement in survival after thermal injury. These gains can be represented by plotting the burn size over time for any age group for which there is a 50% mortality, otherwise known as the LD(sub 50). During this period, all ages have experienced an increase in survival rate. Important events have contributed to this improvement, for example, advances in the management of inhalation injury, aggressive nutritional support, and early excision and grafting of the burn wound. However, the two significant events leading to improved LD(sub 50) have been the institution of physiologically based intravenous fluid resuscitation formulae and the development of effective topical antimicrobial creams. These contributions virtually have eliminated acute renal failure often seen in the burn victim and controlled the microbial density of burn wounds, thereby reducing the occurrence of bacterial wound invasion. Whereas the incidence of burn trauma has leveled off at approximately 2 million burn injuries annually, burn injuries and fires remain a leading cause of accidental death in the US. However, because more than 80% of these injuries are relatively small in extent, their care can be managed effectively in the outpatient setting. Approximately 100,000 patients have injuries sufficient to require inpatient care due to the extent of body surface area involved or location on the body, as many as 7000 succumb to their injury.

Author

Burns (Injuries); Grafting; Intravenous Procedures; Survival

20010020871 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Administering Effective Emergency Care for Severe Thermal Injuries ***Final Report***

Cancio, Leopoldo, Army Inst. of Surgical Research, USA; Mozingo, David W., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; Journal of Critical Illness; February 1997; Volume 12, No. 2; 8p; In English
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383443; Copyright; Avail: Defense Technical Information Center (DTIC)

Patients with severe burns require immediate airway assessment and supplemental oxygen; when inhalation injury is suspected, urgent endotracheal intubation may be needed. Also, during the first 24 hours after thermal trauma, intravascular fluid is rapidly lost into the interstitium; without resuscitation, acute renal failure or even death may ensue from hypovolemic shock. The fluid infusion rate must be carefully calculated from an accurate estimate of the total body surface area burned and titrated according to the physiologic response. Administering excessive amounts of fluid aggravates interstitial edema. Escharotomy

should be performed when constricting eschar results in the diminution of a peripheral pulse. Finally, the possibility of non-thermal injury must not be neglected.
Author
Burns (Injuries); Edema; Patients; Resuscitation

20010020946 NASA Johnson Space Center, Houston, TX USA
Evidence-Based Approach to the Analysis of Serious Decompression Sickness with Application to EVA Astronauts
Conkin, Johnny, National Space Biomedical Research Inst., USA; January 2001; 56p; In English
Contract(s)/Grant(s): NCC9-58
Report No.(s): NASA/TP-2000-210196; NAS 1.60:210196; S-875; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

It is important to understand the risk of serious hypobaric decompression sickness (DCS) in order to develop procedures and treatment responses to mitigate the risk. Since it is not ethical to conduct prospective tests about serious DCS with humans, the necessary information was gathered from 73 published reports. We hypothesize that a 4-hr 100% oxygen (O2) prebreathe results in a very low risk of serious DCS, and test this through analysis. We evaluated 258 tests containing information from 79,366 exposures in attitude chambers. Serious DCS was documented in 918 men during the tests. Serious DCS are signs and symptoms broadly classified as Type II DCS. A risk function analysis with maximum likelihood optimization was performed to identify significant explanatory variables, and to create a predictive model for the probability of serious DCS [P(serious DCS)]. Useful variables were Tissue Ratio, the planned time spent at altitude (T(sub alt)), and whether or not repetitive exercise was performed at altitude. Tissue Ratio is P1N2/P2, where P1N2 is calculated nitrogen (N2) pressure in a compartment with a 180-min half-time for N2 pressure just before ascent, and P2 is ambient pressure after ascent. A prebreathe and decompression profile Shuttle astronauts use for extravehicular activity (EVA) includes a 4-hr prebreathe with 100% O2, an ascent to P2 = 4.3 lb per sq. in. absolute, and a T(sub alt) = 6 hr. The P(serious DCS) is: 0.0014 (0.00096 - 0.00196, 95% confidence interval) with exercise and 0.00025 (0.00016 - 0.00035) without exercise. Given 100 Shuttle EVAs to date and no report of serious DCS, the true risk is less than 0.03 with 95% confidence (Binomial Theorem). It is problematic to estimate the risk of serious DCS since it appears infrequently, even if the estimate is based on thousands of altitude chamber exposures. The true risk to astronauts may lie between the extremes of the confidence intervals (0.00016 - 0.00196) since the contribution of other factors, particularly exercise, to the risk of serious DCS during EVA is unknown. A simple model that only accounts for four important variables in retrospective data is still helpful to increase our understanding about the risk of serious DCS.
Author
Decompression Sickness; Signs and Symptoms; Extravehicular Activity; Astronauts; Males

20010021081
Survey of fundamental technologies in the field of brain neuro-biotechnology, *FY 1997*
Mar. 31, 1998; 161p; In Japanese
Report No.(s): DE99-707590; NEDO-PR-9710; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In Japan with its rapidly aging society, fundamental technologies are required for the development of artificial nerves substituting for or supporting damaged ones, and ultimately constituting artificial neurons based on the knowledge of the brain functions at the molecular and cellular levels. This study defines the fundamental technologies which would be required for the development in the area, and further, evaluates the potential of the technologies to develop the novel industry. The brain function is closely related to the activity in neuronal circuits. In order to repair injured nerves and to develop the advanced technologies of electronics for helping impaired neuronal functions, the most important and urgent is to understand how to work the neuronal circuit system in the brain. Based on these viewpoints, new methodological approaches would make it possible to relieve neural impairment in the sensory input system and the motor system by the use of electronic circuits. They also would improve rehabilitation after injury, and treat neurodegenerative diseases such as Parkinson's disease. These advances surely create the new types of industry seeds in near future.
NTIS
Surveys; Brain; Biotechnology

20010021151 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Enhanced Survival of Autoepidermal-Allodermal Composite Grafts in Allosensitized Animals by Use of Silver-Nylon Dressings and Direct Current *Final Report*
Chu, Chi-Sing, Army Inst. of Surgical Research, USA; McManus, Albert T., Army Inst. of Surgical Research, USA; Matylevich, Natalya P., Army Inst. of Surgical Research, USA; Mason, Arthur D., Army Inst. of Surgical Research, USA; Pruitt, Basil A., Jr.,

Army Inst. of Surgical Research, USA; Journal of Trauma; Aug. 1995; ISSN 1079-6061; Volume 39, No. 2, pp. 273-278; In English; 54th, 29 Sep. - 1 Oct. 1994, San Diego, CA, USA; Sponsored by American Association for the Surgery of Trauma, USA
Contract(s)/Grant(s): DA Proj. 3M1-61102-BS-14
Report No.(s): AD-A383506; Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this research is to observe the effect of silver-nylon (SN) dressing and direct electric current on healing of meshed autoepidermal/allodermal composite skin grafts (MCSFs) in allosensitized rats.

DTIC

Direct Current; Skin Grafts; Silver; Epidermis; Nylon (Trademark); Sensitizing; Rats

20010021152 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Cyanide Poisoning in Victims of Fire: Analysis of 364 Cases and Review of the Literature ***Final Report***

Barillo, David J., Army Inst. of Surgical Research, USA; Goode, Robert; Esch, Victor; Journal of Burn Care and Rehabilitation; Jan./Feb. 1994; ISSN 0273-8481; Volume 15, No. 1, pp. 46-57; In English; 22nd, 26-30 Mar. 1990, Las Vegas, NV, USA; Sponsored by American Burn Association, USA
Contract(s)/Grant(s): DA Proj. 301-62787-A-874
Report No.(s): AD-A383505; Copyright; Avail: Defense Technical Information Center (DTIC)

Cyanide is produced by the combustion of natural and synthetic materials. It is assumed that cyanide poisoning is a major component of smoke inhalation injury; however, scientific verification of this assumption is lacking. In this study we examined blood carboxyhemoglobin and cyanide levels in fire fatalics. Carboxyhemoglobin levels of 433 fatalics averaged 44.9% and exceeded fatal (greater than or equal to 50%) levels in 195 cases. Cyanide levels of 364 fatalities averaged 1.0 mg/L and exceeded fatal levels (greater than 3 mg/L) in 31 cases. For victims with cyanide levels above 3 mg/L the mean carboxyhemoglobin level was 62.5%. Cyanide poisoning is infrequent in fore fatalities, and when present it is associated with significant carboxyhemoglobinemia. Cyanide can be both produced and degraded in blood and tissue, making interpretation of blood levels difficult. In survivors of fire, detoxification of cyanide can occur without specific antidotes with the use of aggressive supportive care. Specific assay and treatment for cyanide poisoning is rarely necessary in the treatment of victims of smoke and fire.

DTIC

Cyanides; Fires; Toxic Diseases; Carboxyhemoglobin; Smoke

20010021153 Army Research Inst. of Environmental Medicine, Natick, MA USA

Blood Volume: Importance and Adaptations to Exercise Training, Environmental Stresses and Trauma/Sickness

Sawka, Michael N., Army Research Inst. of Environmental Medicine, USA; Convertino, Victor A.; Eichner, E. Randy; Schnieder, Suzanne M.; Young, Andrew J.; Medicine and Science in Sports and Exercise; May 2000; ISSN 0195-9131, pp. 332-348; In English
Report No.(s): AD-A383449; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This paper reviews the influence of several perturbations (physical exercise, heat stress, terrestrial altitude, microgravity, and trauma/sickness) on adaptations of blood volume (BV), erythrocyte volume (EV), and plasma volume (PV). Exercise training can induced BV expansion; PV expansion usually occurs immediately, but EV expansion takes weeks. EV and PV expansion contribute to aerobic power improvements associated with exercise training. Repeated heat exposure induces PV expansion but does not alter EV. PV expansion does not improve thermoregulation, but EV expansion improves thermoregulation during exercise in the heat. Dehydration decreases PV (and increases plasma tonicity) which elevates heat strain and reduces exercise performance. High altitude exposure causes rapid (hours) plasma loss. During initial weeks at altitude, EV is unaffected, but a gradual expansion occurs with extended acclimatization. BV adjustments contribute, but are not key, to altitude acclimatization. Microgravity decreases PV and EV which contribute to orthostatic intolerance and decreased exercise capacity in astronauts. PV decreases may result from lower set points for total body water and central venous pressure, which EV decrease bay result form increased erythrocyte destruction. Trauma, renal disease, and chronic diseases cause anemia from hemorrhage and immune activation, which suppressions erythropoiesis. The re-establishment of EV is associated with healing, improved life quality, and exercise capabilities for these injured/sick persons.

Author

Blood Volume; Heat Tolerance; Plasma Loss; Plasmas (Physics); Thermoregulation

20010021237 Army Inst. of Surgical Research, Fort Sam Houston, TX USA

Use of Burn Wound Biopsies in the Diagnosis and Treatment of Burn Wound Infection ***Final Report***

Pruitt, Basil A., Jr., Army Inst. of Surgical Research, USA; McManus, A. T., Army Inst. of Surgical Research, USA; Kim, S. H., Army Inst. of Surgical Research, USA; Cioffi, W. G., Army Inst. of Surgical Research, USA; Die Infektion Biem Brandverletzten; 1993, pp. 55-63; In English

Contract(s)/Grant(s): DA Proj. 301-62787-A-874
Report No.(s): AD-A383552; Copyright; Avail: Defense Technical Information Center (DTIC)

Improvements in both general care and wound care have favorably influenced the outcome of burn patients. Principle among these improvements have been the use of effective topical antimicrobial chemotherapy and the early postburn removal of ischemic nonviable burned tissue by excision, which have reduced the incidence of invasive burn wound infection as a cause of death. Even so, current burn wound care is imperfect and certain patients, usually those with extensive burns that involve more than 50% of the total body surface (particularly children and the elderly), escape from microbial control and develop invasive burn wound infection. The status of the burn wound must be monitored on a scheduled basis utilizing an integrated program of clinical, microbiologic, and pathologic examinations. The similarity of the systemic responses and the changes in laboratory values that accompany uncomplicated burn injury per se to those that accompany infection necessitates that reliance be placed on identifying changes in appearance of the wound that are produced by infections. The wound must be examined at regularly scheduled (at least daily) intervals to identify changes in its appearance that are indicative of infection at a time when the process can be arrested and the patient salvaged.

DTIC

Burns (Injuries); Diagnosis; Infectious Diseases; Wound Healing; Antiinfectives and Antibacterials; Necrosis

20010021239 William Beaumont Army Hospital, Dept. of Clinical Investigation, El Paso, TX USA

New Technologies for Hemorrhage Control ***Final Report***

Holcomb, John B., Army Inst. of Surgical Research, USA; Pusateri, Anthony E., Army Inst. of Surgical Research, USA; MacPhee, Martin J., American Red Cross, USA; Hess, John R., Walter Reed Army Inst. of Research, USA; Current Opinion in Critical Care; June 1997; ISSN 1070-5295; Volume 3, pp. 488-493; In English

Report No.(s): AD-A383549; Copyright; Avail: Defense Technical Information Center (DTIC)

Because inability to control hemorrhage is the leading cause of early death in trauma patients, rapid control of hemorrhage is a cornerstone of effective trauma care. Unfortunately, the basic hemorrhage control methods currently used in modern trauma surgery have not changed for centuries (i.e., tourniquets, gauze dressings, clamps, and silk ligatures). Recently developed techniques, drugs, and devices, including dry fibrin sealants, may improve hemorrhage control and save lives. Life-saving hemorrhage control will always require quick, skillful decisions, and with correct application of these new technologies, potential for rapid and definitive hemorrhage control will be improved.

DTIC

Fibrin; Hemorrhages; Technologies; Sealers; Medical Equipment

20010021240 William Beaumont Army Hospital, Dept. of Clinical Investigation, El Paso, TX USA

Implications of New Dry Fibrin Sealant Technology for Trauma Surgery ***Final Report***

Holcomb, John B., William Beaumont Army Hospital, USA; Pusateri, Anthony E., William Beaumont Army Hospital, USA; Hess, John R., Walter Reed Army Inst. of Research, USA; Hetz, Stephen P., William Beaumont Army Hospital, USA; Harris, Richard A., William Beaumont Army Hospital, USA; Tock, B. Bernadette, American Red Cross, USA; Drohan, William N., American Red Cross, USA; MacPhee, Martin J., American Red Cross, USA; Surgical Clinics of North America; August 1997; ISSN 0039-6109; Volume 77, No. 4, pp. 943-952; In English

Report No.(s): AD-A383548; Copyright; Avail: Defense Technical Information Center (DTIC)

Uncontrolled hemorrhage from injury continues to be a major source of morbidity and mortality for the victims of trauma. This is true for military as well as civilian trauma patients. In Vietnam, 50% of combat deaths were due to uncontrolled hemorrhage. As urban trauma in the USA becomes more lethal, these data are increasingly important. A tremendous amount of time and energy has been devoted to the development of blood substitutes and transfusion therapy, optimal type of resuscitation fluid; and level of resuscitation. Unfortunately, there has been a paucity of research into the active control of bleeding, especially in the prehospital setting. The materials and methods available to stop bleeding at the scene of injury or in the operating room (tourniquets, pressure, bandages, and ligatures) have not changed greatly over 2000 years. These methods are not uniformly effective and may have significant sequelae.

DTIC

Surgery; Sealers; Hemorrhages; Fibrin; Medical Equipment

20010021241 Army Medical Research Inst. of Infectious Diseases, Fort Detrick, MD USA

Anthrax Vaccine: Increasing Intervals Between the First Two Doses Enhances Antibody Response in Humans

Pittman, Phillip R., Army Medical Research Inst. of Infectious Diseases, USA; Mangiafico, Joseph A., Army Medical Research Inst. of Infectious Diseases, USA; Rossi, Cynthia A., Army Medical Research Inst. of Infectious Diseases, USA; Cannon, Timothy

L., Army Medical Research Inst. of Infectious Diseases, USA; Gibbs, Paul H., Army Medical Research Inst. of Infectious Diseases, USA; Parker, Gerald W., Army Medical Research Inst. of Infectious Diseases, USA; Friedlander, Arthur M., Army Medical Research Inst. of Infectious Diseases, USA; Vaccine; 2001; ISSN 0264-410X; Volume 19, pp. 213-216; In English
Report No.(s): AD-A383547; Copyright; Avail: Defense Technical Information Center (DTIC)

The influence of dosing interval on the human antibody response to anthrax vaccine adsorbed (AVA) was evaluated in two retrospective serological studies. In both studies, the interval between the first two doses was 2,3, or 4 weeks. In the first study, banked sera were selected from 89 at-risk individuals at a mean time of 13 days after the second dose of vaccine. In the second study, banked sera were selected from 51 at-risk individuals at a mean time of 48 days following the first dose of AVA. In both studies, the geometric mean and anti-protective antigen IgG antibody titer increased significantly as the interval between the two doses increased from 2 to 4 weeks (p=0.0005-0.029). In the first study, the seroconversion rate also increased as the interval between the first two doses increased (p=0.0034). A prospective, randomized study has been completed and is being analyzed to confirm these findings.
DTIC
Antibodies; Vaccines; Infectious Diseases; Dosage; Adsorption; Human Pathology

20010021243 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Advanced in Burn Wound Care ***Final Report***
Greenfield, Elizabeth, Army Inst. of Surgical Research, USA; Jordan, Bryan, Army Inst. of Surgical Research, USA; Critical Care Nursing Clinics of North America; June 1996; ISSN 0899-5885; Volume 8, No. 2, pp. 203-215; In English
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383522; Copyright; Avail: Defense Technical Information Center (DTIC)

During the past fifty years, the treatment of burn patients has improved in an exponential fashion. Implementation by health care providers of research-based advances in fluid resuscitation, wound care, respiratory and metabolic support, and microbial surveillance and control have improved survival and recovery from this unique injury. The hallmark of thermal injury is the burn wound; however, the wound is but one aspect of this wholebody injury. Rather than a single event, wound healing is a highly integrated process between physiological systems with the uniform goal of cellular repair and wound closure. This article reviews advances in contemporary burn wound care with emphasis on the interaction of the multisystem response required for successful wound treatment and ultimate healing.
DTIC
Burns (Injuries); Wound Healing; Human Pathology; Physiology

20010021244 Army Inst. of Surgical Research, Fort Sam Houston, TX USA
Aeromonas Bacteraemia in Burn Patients ***Final Report***
Barillo, D. J., Jr., Army Inst. of Surgical Research, USA; McManus, A. T., Army Inst. of Surgical Research, USA; Cioffi, W. G., Army Inst. of Surgical Research, USA; McManus, W. F., Army Inst. of Surgical Research, USA; Kim, S. H., Army Inst. of Surgical Research, USA; Pruitt, B. A., Jr., Army Inst. of Surgical Research, USA; Burns; January 1996; ISSN 0305-4179; Volume 22, No. 1, pp. 48-52; In English; 9th; Congress of the International Society for Burn Injuries, June 1994, Paris, France; Sponsored by International Society for Burn Injuries, Unknown
Contract(s)/Grant(s): DA Proj. 3M1-62787-A-874
Report No.(s): AD-A383521; Copyright; Avail: Defense Technical Information Center (DTIC)

Human aeromonas infection is uncommon and is usually associated with immunosuppression, chronic disease or trauma in an aquatic setting. Burn injury may induce a state of immunosuppression, making the thermally injured patient a suitable host for aeromonas infection. We reviewed the experience of one burn centre with this pathogen. Retrospective examination of blood culture results from 8151 patients admitted between 1959 and 1994 disclosed eight patients with clinically relevant Aeromonas hydrolphilia bacteraemia. Five were burned outside the USA. Aquatic exposure was known or suspected in only three cases. Five of the eight patients died. Aeromonas infection in burn patients is rare but may occur in the absence of aquatic exposure.
DTIC
Burns (Injuries); Infectious Diseases; Patients; Bacteria; Immunology

20010021259 Helsinki Univ. of Technology, Dept. of Engineering Physics and Mathematics, Espoo, Finland
Seminar on Biomedical Engineering, 1999
Pietiea, S., Editor, Helsinki Univ. of Technology, Finland; Katila, T., Editor, Helsinki Univ. of Technology, Finland; 1999; 204p; In English
Report No.(s): PB2000-102620; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: non-invasive blood pressure measurement; method for studying membrane transport; photodynamic therapy; instrumentation in optical tomography; comparison of localization methods and accuracies in non-invasive electro and magnetocardiography; molecular motors; translation and rotation; fMRI analysis methods; streotactic radiosurgery; physiological parameters measurable by optical means; interventional magnetic resonance imaging; and a method for measuring free drug concentration in neural tissue
CASI
Conferences; Blood Pressure; Bioengineering; Imaging Techniques; Pressure Measurement; Magnetic Resonance

20010021297 Naval Health Research Center, Dept. of Health Sciences and Epidemiology, San Diego, CA USA
Gender Differences in Musculoskeletal Injury Rates: A Function of Symptom Reporting?, *Jan. - May 1994 and Apr. - Jun. 1996*
Almeida, Sandra A., Naval Health Research Center, USA; Trone, Daniel W., Naval Health Research Center, USA; Leone, Denise M., Naval Health Research Center, USA; Shaffer, Richard A., Naval Health Research Center, USA; Patheal, Sherry L., Naval Health Research Center, USA; Long, Ken, Naval Health Research Center, USA; Medicine and Science in Sports and Exercise; 1999; ISSN 0195-9131; Volume 31, No. 12, pp. 1807-1812; In English
Contract(s)/Grant(s): M0095.008.6504; MIPR-95MM5524
Report No.(s): AD-A384117; NHRC-97-31; Copyright; Avail: Defense Technical Information Center (DTIC)
The purpose of this study is to determine gender differences as it relates to the lower extremity musculoskeletal injuries among U.S. Marine Corps recruits. It also examines the association between these differences and the higher injury rates typically found among women trainees.
Author
Musculoskeletal System; Injuries

20010021324 Institute for Human Factors TNO, Soesterberg, Netherlands
The Somatogravic Effect Without Concomitant Motion *Final Report Het Somatogravisch Effect Zonder Bijkomende Draaibeweging*
Boos, J. E., Institute for Human Factors TNO, Netherlands; Cheung, B., Defence and Civil Inst. of Environmental Medicine, Canada; Groen, E. L., Institute for Human Factors TNO, Netherlands; Jan. 19, 2001; 40p; In English
Contract(s)/Grant(s): 60043; TNO Proj. 789.3
Report No.(s): TD-2000-0344; TM-01-B002; Copyright; Avail: Issuing Activity
Knowledge of self-motion based on the sensory information from the visual, vestibular, and somatosensory systems is essential for the control of self-motion in humans. This study focuses on the contributions from the vestibular and somatosensory cues during linear acceleration as provided by counter-rotation in a short-arm centrifuge. In order to derive the resultant linear motion, gravity should be subtracted from the gravito-inertial acceleration (GIA) as sensed by the proprioceptive systems. This can be achieved by employing a simple first order low-pass filter as suggested in the literature. As a result, the subjective estimate of gravity, the subjective vertical (SV) should lag behind the GIA. This indeed is observed in the somatogravic effect, where a subject experiences tilt while subjected to a linear acceleration. We used the counter-rotation paradigm (CORO) to overcome the problem of interacting angular motion by using a centrifuge with a fixed subject platform to obtain a persistent centripetal linear acceleration. In this CORO-centrifugation the subject is rotated during centrifugation opposite to the centrifuge angular motion, and the centripetal acceleration rotates about him, while his orientation is earth-fixed. The purpose of this study is to investigate the filtering characteristics from the (predicted) lag between GIA and SV under the above paradigm.
Author
Angular Velocity; Attitude (Inclination); Centrifuges; Centrifuging; Sensory Perception

20010021373 Georgetown Univ., Medical Center, Washington, DC USA
Secondary Injury Factors and Preventative Treament in CNS Trauma *Final Report*
Faden, Alan I., Georgetown Univ., USA; 2000; 236p; In English
Contract(s)/Grant(s): R49/CCR306634
Report No.(s): PB2001-102205; Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
This grant focused on three major research areas: (1) identification/elucidation of secondary injury factors that contribute to delayed neuronal/tissue loss, using tools from molecular and cellular neurobiology; (2) development of new in vitro and in vivo trauma models to accelerate the discovery of pathobiological mechanisms and the investigation of new pharmacological treat-

ments; and (3) evaluation of novel pharmacological treatments to limit secondary injury and improve neurological outcome for potential clinical use.
NTIS
Injuries; Central Nervous System; Neurophysiology; Clinical Medicine; Brain Damage

20010021385 Wayne State Univ., Detroit, MI USA
Recombinant Breast Cancer Vaccines ***Annual Report, 1 Sep. 1998 - 31 Aug. 1999***
Pilon, Shari, Wayne State Univ., USA; Wei, Wei-Zen, Wayne State Univ., USA; September 1999; 24p; In English
Contract(s)/Grant(s): DAMD17-98-1-8265
Report No.(s): AD-A384110; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Recombinant DNA vaccines encoding mutant ErbB-2, a transmembrane tyrosine kinase mediating oncogenic activity, have been constructed. In ERBB-2A (E2A), tyrosine kinase activity was eliminated by replacing the ATP binding residue 753 lysine with alanine. to generate cytosolic proteins, (cytE2, cytE2A), the ER signal sequence was deleted. Vaccination of BALB/c mice with DNA encoding transmembrane E2 or E2A induced anti-ErbB-2 antibodies and anti-tumor immunity, with E2 being more potent than E2A. Elimination of CD4 T cells prevented the induction of anti-ErbB-2 antibody which, therefore, serves as an indicator of CD4 help. Vaccination with cytE2A induced little protection against tumor growth and no antibody production. Co-vaccination with cytE2A and plasmid encoding IL-2 or GM-CSF protected 80% of mice against tumor challenge although no antibody was induced. These results indicated that CD4 T cell activation by transmembrane ERBB-2 but not cytoplasmic ERBB-2 was critical to anti-tumor immunity and can be replaced, in part, by cytokine co-vaccination and that signal transduction by ErbB-2 may contribute to ErbB-2 immunogenicity.
DTIC
Mammary Glands; Cancer; Carcinogens; Vaccines; Antibodies

20010021386 ManTech Environmental Technology, Inc., Dayton, OH USA
Repeated Dose Skin Irritation Study on Jet Fuels: Preliminary Dose Range Finding Study ***Interim Report, Apr. - Jul. 1998***
Baker, W., Army Medical Research Unit, USA; English, J., Army Medical Research Unit, USA; Miller, T., Armstrong Lab., USA; Dodd, D.; McDougal, J.; January 1999; 23p; In English
Contract(s)/Grant(s): F41624-96-C-9010; AF Proj. 7757
Report No.(s): AD-A384078; AFRL-HE-WP-TR-1999-0008; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

JP-8 is the battlefield fuel for DoD and NATO countries. Questions have been raised about the human health implications of occupational exposure to JP-8, as compared to the phased out JP-4. No scientific information is available on the effect of repeated skin contact with JP-8. Before initiating an investigation using the rat as an animal model for skin irritation with jet fuels, several laboratory procedures needed to be addressed. During this preliminary dose range finding study, an opportunity to preview the nature and severity of skin lesions to be encountered in a subchronic repeated dose jet fuel study was gained. Depending on the type of fuel and the frequency of application, a range of skin response scores was determined, primarily on the basis of histopathological evaluation. In general, JP-4 was less irritating than JP-8. Seven recommendations for a definitive study are given.
DTIC
JP-4 Jet Fuel; JP-8 Jet Fuel; Exposure; Jet Engine Fuels

20010021483 Institute for Nutrition and Food Research TNO, Zeist, Netherlands
Review of Dietary Intervention to Reduce Risk of Heart Disease ***Final Report Review Voedingsinterventies Op Het Gebied van Hart - en Vaatziekten***
vandeVijver, L.P.L., Institute for Nutrition and Food Research TNO, Netherlands; December 2000; 86p; In Dutch
Contract(s)/Grant(s): A00/KL/102; TNO Proj. 20333/01.01
Report No.(s): TD-2000-0370; TNO-Voeding-V3162; Copyright; Avail: Issuing Activity

In this report a review is given of dietary intervention studies aiming at a lowering of the risk of coronary heart disease (CHD). Following on a description of both primary and secondary intervention studies, the result of the Lyon Diet Heart Study are discussed in more detail. In this secondary intervention study, a lowering of the CHD risk by more than 65% was reached after 3.8 years of follow-up by changing the ordinary French diet into a Mediterranean type of diet. The specific dietary components of the Mediterranean diet and their possible mechanism in decreasing CHD are discussed. In the second part of the report the role of antioxidants are brought into focus and the role of supplementation with the antioxidant vitamins C, E and beta-carotene and coenzyme Q(10) is discussed. It is concluded that a change of diet into a more Mediterranean type of diet is potentially beneficial

in decreasing the risk of CHD. For supplementation with specific antioxidants the results are not conclusive, however supplementation with a combination of antioxidants might be beneficial. This, however, needs to be confirmed by further research.
Author
Coronary Artery Disease; Diets; Risk

20010021486 Institute of Space Medico-Engineering, Beijing, China
Changes in Electrocardiogram and Cardiac Phase During Various Stages in Foreign Manned Spaceflight Activities and the Analysis of Their Possible Mechanisms
Wang, De-Sheng, Institute of Space Medico-Engineering, China; Ren, Wei, Institute of Space Medico-Engineering, China; Xiang, Qiu-Lu, Institute of Space Medico-Engineering, China; Sun, Lei, Institute of Space Medico-Engineering, China; Liu, Zhao-Xia, Institute of Space Medico-Engineering, China; Su, Shuang-Ning, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 464-468; In Chinese; Copyright; Avail: Issuing Activity

Electrocardiography (ECG) is still the only method for continuous medical observation during various stages of foreign manned spaceflight activities, and it also serves as an important item for medical monitoring in the project for manned spaceflight activities in our country. With electrocardiography, pulse or heart rate(one of the four life signs) and cardiac function can continuously be observed. Cardiac phase relative to ECG is a main index reflecting cardiac function. Understanding of the results of ECG and cardiac phase and their mechanisms during various stages of foreign manned spaceflight activities will be helpful in establishing emergency measures in the course of manned spaceflight activities in our country.
Author
Electrocardiography; Heart Function; Observation

20010021487 Institute of Space Medico-Engineering, Beijing, China
Changes of Learning and Memory Function Under Weightlessness or Simulated Weightlessness
Wu, Da-Wei, Institute of Space Medico-Engineering, China; Shen, Xian-Yun, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 459-463; In Chinese; Copyright; Avail: Issuing Activity

The work efficiency of astronauts has an intimate connection with the brain function state during space flight. The research results of the learning and memory mechanism of the brain in recent years were introduced. The effects of weightlessness or simulated weightlessness on brain's learning, memory, focused attention and many other higher neural activities and on the relative neural transmitters were summarized. Several research aspects were put forward in the future.
Author
Brain; Learning; Memory

20010021489 Institute of Aviation Medicine, Beijing, China
Data Analysis of 492 Times Centrifuge Examination
Chu, Xu, Institute of Aviation Medicine, China; Geng, Xi-Chen, Institute of Aviation Medicine, China; Zhang, Wu-Xing, Institute of Aviation Medicine, China; Zhan, Chang-Lu, Institute of Aviation Medicine, China; Wang, Rong-Di, Institute of Aviation Medicine, China; Yan, Gui-Ding, Institute of Aviation Medicine, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 451-455; In Chinese; Copyright; Avail: Issuing Activity

To sum the experiences and to find the regularity of centrifuge examinations. The data of nine years of centrifuge examination (from 1988 to 1996) of pilots who suffered from black out or LOC frequently were analyzed. There were totally 492 times centrifuge examinations. First centrifuge examination included 229 pilots, 49 qualified, 180 unqualified. Second centrifuge examination included 263 pilots, 50 qualified, 213 unqualified. The pilots were all male. The average age of first centrifuge examination was 29.27 +/- 4.87 years. Average flying time was 1015.24 +/- 131.89 h. 68.7% of their plane was JJ - 6 or above. Most pilots undergoing centrifuge examination these nine years were 26 approx. 35 year old, and had flown for 601 approx. 1200 h. The planes they flew are mostly high-performance fighter aircraft. Close attention must be paid to pilots under similar condition by the flight surgeon. It is recommended that the special equipment of G-tolerance training should be added to the fighter aircraft units.
Author
Data Processing; Centrifuges; Regulations

20010021491 Institute of Space Medico-Engineering, Beijing, China

Early Diagnosis of Sub-Healthy Status by Tsing Hua Multimedia Computing Microscopy Diagnostic Instrument (THMMDI) Examination

Qian, Jin-Kang, Institute of Space Medico-Engineering, China; Ba, Fu-Sen, Institute of Space Medico-Engineering, China; Wu, Yuan-Liang, Institute of Space Medico-Engineering, China; Wang, Li-Yuan, Institute of Space Medico-Engineering, China; Sun, Jian, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 444-447; In Chinese; Copyright; Avail: Issuing Activity

To check the accuracy of THMMDI diagnosis with clinical physical examination. 86 blood samples from tip of small fingers were examined with THMMDI. Diagnostic results of THMMDI were compared with those of routine clinical physical examination. General diagnostic coincidence rate was 78. 0 percent, and coincidence of positive rate was 90 percent, 25 percent signs diagnosed as negative in physical examination were considered to be ill-healthy by THMMDI. Though a few misdiagnosis may exist, most of them were considered to be early diagnosis. In order to discover the ill-healthy subjects early. Routine health examination and other diagnostic measures should be practiced widely. THMMDI might be an accurate, rapid, objective and convenient means. Key words: microscopy; health; blood; diagnosis

Author

Diagnosis; Accuracy; Physical Examinations

20010021492 People's Liberation Army Hospital, Chengdu, China

Heart Morphologic State in Retired Fighter Pilots

Yang, Xiang-E, People's Liberation Army Hospital, China; Chen, Zhi-Gang, People's Liberation Army Hospital, China; Long, Li, People's Liberation Army Hospital, China; Zhai, Da-Sheng, People's Liberation Army Hospital, China; Zhao, Xiang-Jun, People's Liberation Army Hospital, China; Fang, Rong-You, People's Liberation Army Hospital, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 440-443; In Chinese; Copyright; Avail: Issuing Activity

To study the heart morphology in the retired fighter pilots,and to provide clinical evidence for protection combined G-loads (+ Gz), heat, noise, hypoxic and vibration stress induced cardiac structural damage. Parameters of heart morphology were studied using Doppler echocardiography in 40 retired fighter pilots with 40 veteran cadres as control. LVDd, LVDs, LADs, LVEDV, LVPWs and LVM in pilot group were somewhat higher than those in control group (NS); while IVSs and LVMI in pilot group were slightly lower than those in control group (NS) ; LVESV, aortic valve area , internal diameter of the ring and sinus in pilot group were significantly higher than those in control group (P less than 0.05). Analysis of the results revealed no pathomorphologic damage of the heart. It suggest that all the variations can be regarded as adaptive changes due to the effects of the combined environmental factors experienced in long time flying.

Author

Aircraft Pilots; Research; Gerontology; Heart; Morphology

20010021493 China Scientific and Technical Univ., Dept. of Electronic Engineering and Information Science, Anhui, China

Discrete Cosine Transform-Based ECG Data Compression by Template

Fei, Xiao-Ying, China Scientific and Technical Univ., China; Wang, Pei-Kang, China Scientific and Technical Univ., China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 435-439; In Chinese; Copyright; Avail: Issuing Activity

To study a method with high compression ratio (CR) and high quality reconstructed wave for ECG data processing. The QRS complex portions were first interpolated, then the period and the amplitude of each beat were normalized. An average beat was extracted from a certain number of preprocessed cycles of data and its DCT coefficient sequence was used as a template. Hence, a difference sequence by subtracting the template data from DCT coefficients of each cycle was obtained. Only the difference sequence was encoded and transmitted. Because the amplitude of the difference sequence was low and the number of the data to be transmitted was small, the CR achieved by this way was high. The present method is capable of obtaining the higher compression ratio in ECG data processing. Key words:data compression; ECG; discrete cosine transform(DCT)

Author

Compression Ratio; Data Compression; Discrete Cosine Transform; Templates

20010021494 Institute of Space Medico-Engineering, Beijing, China

The Method of Reducing Respiratory Interference in Right Chest Impedance Wave

Guo, Jian-Ping, Institute of Space Medico-Engineering, China; Hu, Mao-Qi, Institute of Space Medico-Engineering, China; Zhang, Qi-Shan, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 431-434; In Chinese; Copyright; Avail: Issuing Activity

To find a method of reducing Respiratory Interference in measurement of right chest impedance. The improvement of coherent averaging method of Reducing Respiratory Interference was discussed, and evaluation-fitting respiratory wave and filter of Chebyshev' s polynomial as presented. The result indicated that evaluation-fitting of respiratory wave is better than other methods in its character of real time and keeping pulse information. It solved difficulty in real time monitoring.
Author
Chebyshev Approximation; Chest; Plethysmography; Impedance Measurement; Respiratory System; Wave Excitation

20010021496 Beijing Univ. of Aeronautics and Astronautics, Inst. of Man-Machine-Environment System Engineering, Beijing, China
Changes of Pilot's Head Dimensional and Their Ergonomical Significance
Wang, Xing-Wei, Beijing Univ. of Aeronautics and Astronautics, China; Yuan, Xiu-Gan, Beijing Univ. of Aeronautics and Astronautics, China; Cong, Hong, Beijing Univ. of Aeronautics and Astronautics, China; Sun, Ming-Zhao, Beijing Univ. of Aeronautics and Astronautics, China; Wang, Rong-Di, Beijing Univ. of Aeronautics and Astronautics, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 422-426; In Chinese; Copyright; Avail: Issuing Activity

To investigate the extent and tendency of changes in pilots' head dimensions and head-types taken place with the passage of time. 10 head dimensions of 80 pilots were measured and studied,and compared with data obtained in the 70s. 8 of 10 dimension values were significantly different from data obtained in the 70s (P less than 0.01). The general head characteristic-spherical-head-type-didn't change,but head became more spherical,and the distribution of various head-type changed slightly. There was no significant difference in all 10 head dimensions between student pilots and teacher pilots and among the pilots from all 5 regions of the country (P greater than 0.05). The change in most head dimensions and the constancy(but more spherical) in general head characteristic should be fully considered in the design of head protective equipments. The equipment sizes and types could be the same for student pilots and teacher pilots and pilots from different regions. Pilot head dimension model should be established. Unifying the dimension criterion while recruiting pilots in different regions would help in improving the suitability of protective equipment.
Author
Anthropometry; Human Factors Engineering; Head (Anatomy)

20010021497 Institute of Space Medico-Engineering, Beijing, China
Approximate Entropy and its Application in Heart Rate Variability Analysis
Gu, Hua-Guang, Institute of Space Medico-Engineering, China; Ren, Wei, Institute of Space Medico-Engineering, China; Liu, Gang, Institute of Space Medico-Engineering, China; Shen, Xian-Yun, Institute of Space Medico-Engineering, China; Meng, Jing-Rui, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 417-421; In Chinese; Copyright; Avail: Issuing Activity

To introduce approximate entropy in the analysis of heart rate variability, and to discuss the changes of the complexity of cardiovascular system during orthosatic standing posture. Method ECG of 8 subjects were recorded during supine and orthosatic standing postures. Approximate entropy was used to analyze HRV. Compared to supine before orthosatic standing posture, R-R intervals at 0 approx. 5 min,5 approx. 10 min, 10 approx. 15 min and 15 approx. 20 min during orthosatic standing posture were decreased significantly,while approximate entropy at 0 approx. 5 min and 15 approx. 20 min decreased significantly. It showed that the complexity of cardiovascular system was decreased and the modulation of cardiovascular system changed. It is feasible that approximate entropy be used for heart rate variability analysis.
Author
Entropy; Heart Rate; Approximation; Variability

20010021498 Naval General Hospital, Aviation and Diving Medical Center, Beijing, China
Effects of Acute Hypoxia on Plasma Lactic Acid and Lactic Dehydrogenase Content in Pilots
Liu, Yu, Naval General Hospital, China; Qin, Shi-Zhen, Naval General Hospital, China; Li, Wen-Bin, Naval General Hospital, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 414-416; In Chinese; Copyright; Avail: Issuing Activity

To study the effect of acute moderate hypoxia on plasma lactic acid(LA) and lactic dehydrogenase(LDH) content in pilots. Concentrations of plasma LA and LDH were measured by colorimetry in 16 healthy male pilots in the early morning(6:00 a.m.), following acute moderate hypoxic exposure(10:00 a.m.) and 6 hours after returned to the ground(4: 00 p.m.). 16 healthy.male ground people served as control group, and their plasma LA and LDH contents were assayed at corresponding time. Plasma LA after moderate hypoxic exposure in the pilot group was significantly higher than that at 6:00 a.m. 4:00 p.m. and control group(P less than 0.01). While the content at 6:00 a.m. 4:00 p.m. in pilot group was not significantly different from the control group (

P greater than 0.05). The content of plasma LDH after moderate hypoxic exposure in the pilot group was not significantly higher than that at 6:00 a.m., 4:00 p.m. and control group (P greater than 0.05). Acute moderate hypoxia can make the plasma LA content increase in pilots, and reach to the normal level within 6 h. While the LDH content has no significantly change.
Author
Hypoxia; Plasma Chemistry; Lactic Acid

20010021500 Institute of Space Medico-Engineering, Beijing, China
Effects of Some Physical Training on Vestibular Function
Wang, Lin-Jie, Institute of Space Medico-Engineering, China; Sun, Hong-Yi, Institute of Space Medico-Engineering, China; Pei, Jing-Chen, Institute of Space Medico-Engineering, China; Liu, Xing-Hua, Institute of Space Medico-Engineering, China; Tong, Bo-Lun, Institute of Space Medico-Engineering, China; Wang, Jun, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 405-409; In Chinese; Copyright; Avail: Issuing Activity

To study the effects of active vestibular conditioning by some physical training on the vestibular function. 10 subjects were given five kinds training gyro wheel, hanging ladder, ripple wood, four column swing and rotating swing for two weeks. Vestibular experimental tests were given before and after training. After physical training, subjects' linear acceleration tolerance time increased significantly the result of computer dynamic equilibrium posturegraphy demonstrated that the sway of body center of gravity decreased significantly when subjects maintained their equilibrium by both vestibular and visual information. The linear acceleration physical training methods used in this experiment have positive effects,while the methods of angular acceleration training need further investigation.
Author
Angular Acceleration; Dynamic Tests; Physical Exercise; Posture; Vestibular Tests; Visual Perception

20010021553 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Wind Chill: Whole Body vs. Facial Cooling
Osczevski, Randall J.; Nov. 06, 2000; 23p; In French
Contract(s)/Grant(s): Proj-2CK05
Report No.(s): AD-A385590; DCIEM-TR-2000-089; Copyright; Avail: Issuing Activity

This report examines the question of whether windchill should be calculated as an effect of exposed skin heat transfer or of whole body heat loss. Theory suggests that it is not possible to derive a useful index of windchill based on heat transfer through normal outdoor winter clothing. A test is described that demonstrates that one proposed index, AT, which is based on a clothed, whole body model, does not consistently and uniquely correspond to levels of human sensation. That is, the same value of AT results from wind and temperature combination that produce different cold sensations. Refinements to the DCIEM Facial Cooling Model to include a variable internal thermal resistance, dependent on skin temperature, are described. This model of windchill is based on cooling of the windward side of a cylinder. Any equivalent temperature calculated with this model corresponds to only a narrow range of thermal sensation.
DTIC
Wind Effects; Wind (Meteorology); Cooling; Body Temperature; Atmospheric Temperature

20010021585 Institute of Space Medico-Engineering, Beijing, China
Effects of Noise and Music on EEG Power Spectrum
Yuan, Quan, Institute of Space Medico-Engineering, China; Liu, Xing-Hua, Institute of Space Medico-Engineering, China; Li, Da-Chen, Institute of Space Medico-Engineering, China; Wang, Hai-Li, Institute of Space Medico-Engineering, China; Liu, Yu-Sheng, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 401-404; In Chinese; Copyright; Avail: Issuing Activity

To observe the effect of noise and music on EEG power spectrum. 12 healthy male pilots aged 30 +/- 0.58 years served as the subjects. Dynamic EEG from 1.6 regions was recorded during quiet, under noise or when listening to music using Oxford MR95 Holter recorder. Changes of EEG power spectrum of delta, theta, alpha1, alpha2, beta1 and beta2, frequency components in 16 regions were analyzed. The total alpha1 power was significantly decreased, while the total theta power was significantly increased when listening to music; it implies that the interhemispheric transmission of information in the frontotemporal areas might be involved. The changes of the EEG power spectrum were closely related to man's emotions; relaxation was associated with music; Individual difference exists in the influence of sound on EEG.
Author
Data Transmission; Music; Noise (Sound); Electroencephalography

20010021586 Institute of Space Medico-Engineering, Beijing, China

Stability of EEG Complexity Measure Related to Brain Function State

Han, Dong-Xu, Institute of Space Medico-Engineering, China; Zhou, Chuan-Dai, Institute of Space Medico-Engineering, China; Liu, Yue-Hong, Institute of Space Medico-Engineering, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 396-400; In Chinese; Copyright; Avail: Issuing Activity

To study the stability of EEG complexity measure related to brain function state (Cs) under rest and mental arithmetic,and to preliminary examine the brain stable regions with specific changes under mental arithmetic and its mechanism of mental arithmetic. EEG of 10 subjects aged 24 approx. 33 under rest(O) and mental arithmetic(1) were repeatedly recorded (state order: 01010). Stability of CS under the two conditions and the differences between them was analyzed. Cs under the two conditions showed sufficient stability. In 9 subjects, Cs under mental arithmetic all ascended regularly and outstandingly at left posterior temporal region, as well as at left parieto-occipital and right temporal region. In 1 subject, CS under mental arithmetic descended outstandingly at pre-temporal and prefrontal regions. Cs under the two conditions all possesses high stability. While doing mental arithmetic, outstanding and regular changes of Cs appeared, and the focalized results were in good accordance with achievements in physiology, psychology and clinical neurology. It is very important to study the brain function state and mechanism of its activity.

Author

Brain; Neurology; Electroencephalography

20010021615 Centers for Disease Control and Prevention, Atlanta, GA USA

Morbidity and Mortality Weekly Report: Strategies for Reducing Exposure to Environmental Tobacco Smoke, Increasing Tobacco-Use Cessation, and Reducing Initiation in Communities and Health-Care Systems, Volume 49

Aug. 2000; 24p; In English

Report No.(s): PB2001-102513; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Reducing tobacco-related morbidity and death is an ongoing challenge for health-care providers, health-care systems, and public health programs. Interventions are available that (1) reduce exposure to environmental tobacco smoke, (2) reduce tobacco-use initiation, and (3) increase tobacco-use cessation. The Task Force on Community Preventive Services has conducted systematic reviews on 14 selected interventions, which are appropriate for communities and health-care systems, and has made recommendations regarding use of these interventions. This report summarizes the recommendations, identifies sources that offer full reviews of the interventions and details about applying the interventions locally, and provides an update of the Task Force's work.

NTIS

Mortality; Tobacco; Smoke; Public Health; Exposure; Death

20010021655 Army Research Inst. of Environmental Medicine, Thermal and Mountain Medicine Div., Natick, MA USA

Fluid and Electrolyte Supplementation for Exercise Heat Stress

Sawka, Michael N., Army Research Inst. of Environmental Medicine, USA; Mountain, Scott J., Army Research Inst. of Environmental Medicine, USA; American Journal for Clinical Nutrition; 2000; Volume 72, pp. 564S-572S; In English; Role of Dietary Supplements for Physically Active People, 3-4 Jun. 1996, Bethesda, MD, USA

Report No.(s): AD-A384562; Copyright; Avail: Defense Technical Information Center (DTIC)

During exercise in the heat, sweat output often exceeds water intake, resulting in a body water deficit (hypohydration) and electrolyte losses. Because daily water losses can be substantial, persons need to emphasize drinking during exercise as well as at meals. For persons consulting a normal diet, electrolyte supplementation is not warranted except perhaps during the first few days of heat exposure. Aerobic exercise is likely to be adversely affected by heat stress and hypohydration. The warmer the climate the greater the potential for performance decrements. Hypohydration increases heat storage and reduces a person's ability to tolerate heat strain. The increased heat storage is mediated by a lower sweating rate (evaporative heat loss) and reduced skin blood flow (dry heat loss) for a given core temperature.Heat-acclimated persons need to pay particular attention to fluid replacement because heat acclimation increases sweat losses, and hypohydration negates the thermoregulatory advantages conferred by acclimation. It has been suggested that hyperhydration (increased total body water) may reduce physiologic strain during exercise heat stress, but data supporting that notion are not robust. Research is recommended for three populations with fluid and electrolyte balance programs, and persons with spinal cord injuries.

Author

Physical Exercise; Electrolytes; Heat Storage; Heat Acclimatization; Body Fluids; Temperature Effects

20010021662 Naval Medical Research Inst., Malaria Program, Rockville, MD USA

Multi-Gene Vaccination Against Malaria: A Multistage, Multi-Immune Response Approach

Doolan, Denise L., Naval Medical Research Inst., USA; Hoffman, Stephen L., Naval Medical Research Inst., USA; Parasitology Today; 1997; ISSN 0169-4758; Volume 13, No. 5, pp. 171-178; In English

Report No.(s): AD-A384584; Copyright; Avail: Defense Technical Information Center (DTIC)

An ideal malaria vaccine will induce immune responses against each stage of the Plasmodium spp life cycle. During its complicated life cycle, the parasite exists extracellularly in the host's bloodstream, within cells that express major histocompatibility complex (MHC) molecules (hepatocytes), within cells that do not express MHC molecules (erythrocytes) and within the mosquito vector. Different arms of the immune system are required to attack the parasite at the different stages. Therefore, a multistage vaccine must be a multi-immune response vaccine. In addition, given the unique antigenicities of the different stages of the life cycle, implicit in this definition is that the vaccine must be multivalent.

Author

Vaccines; Parasitic Diseases; Erythrocytes; Life (Durability); Physiological Responses

20010021663 Naval Medical Research Inst., Resusitative Medicine Program, Bethesda, MD USA

Transfection with aFGF cDNA Improves Wound Healing

Sun, Li-Ying, Naval Medical Research Inst., USA; Xu, Lan, Naval Medical Research Inst., USA; Chang, Henry, Naval Medical Research Inst., USA; Henry, Fleetwood A., Naval Medical Research Inst., USA; Miller, Robert M., Naval Medical Research Inst., USA; Harmon, John M., Veterans Administration, USA; Nielsen, Thor B., Naval Medical Research Inst., USA; Journal of Investigative Dermatology; March 1997; ISSN 0022-202X; Volume 108, No. 3, pp. 313-318; In English

Contract(s)/Grant(s): MR04120.001-1422

Report No.(s): AD-A384577; Copyright; Avail: Defense Technical Information Center (DTIC)

Somatic gene therapy is a potentially useful strategy for the delivery of growth factors or cytokines to enhance wound healing. Experimental excisional and incisional wounds in impaired-healing diabetic mice (db/db) were treated with aFGF and with a plasmid coding for aFGF. eukaryotic expression plasmid composed of the Hst signal peptide sequence in-frame with the human aFGF sequence was used. Transfection of tissues was accomplished either by direct plasmid uptake or by uptake facilitated with cationic liposomes.The results show that the closure of excisional wounds was significantly accelerated (p is less than 0.05) by topical application of of human recombinant aFGF or by transfection with the aFGF plasmid, but not by vehicle or control plasmid not containing the aFGF sequence.

Author

Wound Healing; Deoxyribonucleic Acid; Metabolic Diseases; Eukaryotes

20010021665 Rochester Univ., NY USA

Trial of Two Decision Aids for Colon Cancer Screening. Abstract, Executive Summary, and Final Report ***Final Report, 30 Sep. 1999 - 29 Sep. 2000***

Dolan, James G., Rochester Univ., USA; Frisina, Susan, Rochester Univ., USA; [2000]; 64p; In English

Contract(s)/Grant(s): HS-10728

Report No.(s): PB2001-102564; AHRQ-2001-14; Copyright; Avail: National Technical Information Service (NTIS)

This randomized controlled trial compared the effects of a patient decision aid based on multicriteria decision making theory with those of the simple education intervention on the process and outcome of decisions regarding colorectal cancer screening for average risk patients. Ninety six patients seen in a primary care office in Rochester, New York participated. After controlling for the effects of the physicians in a factorial analysis of variance, patients who used the decision aid had lower decisional conflict regarding colorectal cancer screening decisions (F ratio 6.47, p = 0.01). This improvement in patient decision process was due to increased knowledge, better clarity of values, and higher patient ratings of the quality of the decisions they made. There was no difference between the groups in decision outcomes: 52% of patients in the control group and 49% in the experimental group completed planned screening tests (p = 1.0). These results indicate that multicriteria-based patient decision aid for colorectal cancer screening improved patients' decision making processes regarding colorectal cancer screening but had no effect on the implementation of screening decisions.

NTIS

Decision Support Systems; Cancer

20010021671 Public Health Service, Research Triangle Park, NC USA

Toxicology and Carcinogenesis Studies of Gallium Arsenide (CAS No. 1303-00-0) in F344/N Rats and B6C3F1 Mice. (Inhalation Studies)

September 2000; 322p; In English

Report No.(s): PB2001-102003; NTP-TR-492; Copyright; Avail: National Technical Information Service (NTIS)

Under the conditions of these 2-year inhalation studies, there was no evidence of carcinogenic activity of gallium arsenide in male F344/N rats exposed to 0.01, 0.1, or 1.0 mg/cubic m. There was clear evidence of carcinogenic activity in female F344/N rats based on increased incidences of benign and malignant neoplasms in the lung. Increased incidences of benign neoplasms of the adrenal medulla and increased incidences of mononuclear cell leukemia were also considered to be exposure related. There was no evidence of carcinogenic activity in male or female B6C3F1 mice exposed to 0.1, 0.5, or 1.0 mg/cubic m. Exposure to gallium arsenide caused a spectrum of nonneoplastic lesions in the lung of rats and mice, the larynx of male rats and hyperplasia of the tracheobronchial lymph node in mice.

NTIS

Toxicology; Carcinogens; Neoplasms; Exposure; Gallium Arsenides; Lungs

20010021704 Civil Aeromedical Inst., Oklahoma City, OK USA

Galactic Cosmic Radiation Exposure of Pregnant Aircrew Members II ***Final Report***

Nicholas, J. S., Medical Univ. of South Carolina, USA; Copeland, K., Federal Aviation Administration, USA; Duke, F. E., Federal Aviation Administration, USA; Friedberg, W., Federal Aviation Administration, USA; OBrien, K., III, University of Northern Arizona, USA; Oct. 2000; 14p; In English

Contract(s)/Grant(s): AM-PHY305

Report No.(s): PB2001-102921; DOT/FAA/AM-00/33; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In its 1990 recommendation regarding occupational exposure during pregnancy, the International Commission on Radiological Protection apparently assumed that the equivalent dose to a pregnant woman's abdomen is reduced by half in traversing the body to the conceptus. This assumption was tested with respect to galactic cosmic radiation, the principal ionizing radiation to which aircrews are exposed. We calculated the equivalent dose that would be received at depths of 0, 5, 10, and 15 centimeters in a 30-centimeter thick, soft-tissue slab phantom, at several locations in the atmosphere and on two air carrier flights, and found that the dose was almost the same at all the tissue depths studied. Thus, the assumption of considerable shielding of the conceptus by the woman's body is not valid with respect to galactic cosmic radiation. The effective dose of galactic radiation to the mother was found to be a good estimate of the equivalent dose to the conceptus.

NTIS

Air Transportation; Radiation Protection; Flight Crews; Cosmic Rays; Pregnancy; Galactic Radiation

20010021739 Harvard Medical School, Boston, MA USA

Validating Guidelines for Treatment of Patients with Acute Myocardial Infarction. Abstract, Executive Summary and Final Report

McNeil, Barbara J., Harvard Medical School, USA; [2000]; 50p; In English

Contract(s)/Grant(s): HS-08071

Report No.(s): PB2001-102655; AHRQ-2001-11; Copyright; Avail: National Technical Information Service (NTIS)

We used data from the Cooperative Cardiovascular Project and studied experiences of patients in hospital and on discharge after an acute myocardial infarction. Patients were hospitalized in one of seven states (California, Florida, Massachusetts, New York, Ohio, Pennsylvania, and Texas) between January 1, 1994 and July 31, 1995. These data were supplemented by information from the Veterans Administration, risk plans caring for Medicare enrollees, surveys from the American Hospital Association, surveys of hospital managers and physicians conducted by us, and surveys conducted by us with a sample of patients from this cohort. Our major result shows that there is marked under-use of necessary angiography for patients who have suffered an AMI. This occurred in virtually all comparison groups examined, though it was highest (largest percentage of under-use) in patients in managed care settings and those with comorbid conditions, particularly chronic renal insufficiency. Treatment in rural hospital or one that lacked angiography capability also predicted under-use. We present several policy recommendations as well as opportunities for additional research.

NTIS

Cardiovascular System; Angiography; Myocardial Infarction; Patients

20010021740 Pittsburgh Univ., Pittsburgh, PA USA

Benefit of CEA in Patients with Contralateral Occlusion. Abstract, Executive Summary and Final Report ***Final Report, 1 Sep. 1996 - 31 Aug. 2000***

Pindzola, Rhonda R., Pittsburgh Univ., USA; [20001]; 20p; In English

Contract(s)/Grant(s): HS-09021

Report No.(s): PB2001-102654; AHRQ-2001-10; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The objective is to assess TCD in comparison to Xe/CT CBF for identifying patients with compromised reserves (CVR). CVR before and after acetazolamide administration was measured by TCD and stable Xe/CT CBF of the middle cerebral artery (MCA) in thirty-two patients with carotid occlusion. Sensitivity/specificity calculations were based on two values: 1) an average over 4 levels of the MCA, and 2) the MCA level with the lowest percent change. No reactivity or a decrease in reactivity were considered as compromised.

NTIS

Identifying; Patients; Occlusion

20010021741 Johns Hopkins Univ., Center for Clinical Trials, Baltimore, MD USA

National Emphysema Treatment Trial (NETT) Protocol ***Final Report***

Jun. 21, 1999; 82p; In English

Report No.(s): PB2001-102646; Copyright; Avail: National Technical Information Service (NTIS)

The National Emphysema Treatment Trial (NETT) is a multicenter, randomized clinical trial of usual medical therapy alone versus usual medical therapy plus lung volume reduction surgery (LVRS) for moderate to severe emphysema. LVRS will be administered by bilateral staple excision via median sternotomy (MS) or video assisted thoracoscopy (VATS). Every patient will complete 6 to 10 weeks of pulmonary rehabilitation prior to randomization and will participate in a maintenance program of pulmonary rehabilitation from randomization onward. The trial is designed to determine if the addition of LVRS to medical therapy results in improved survival. In addition to survival, other outcomes will be used to evaluate the relative benefits and risks of surgical versus medical therapy: maximum exercise capacity, pulmonary function, oxygen requirement, six minute walk distance, quality of life, respiratory symptons, and health care utilization and costs. Additional measures, to be evaluated only at selected clinics, include lung mechanics and respiratory muscle function, partial and maximal flow-volume curves, gas exchange during maximal exercise, and right heart function. Two thousand five hundred patients with moderate to severe emphysema who have no significant co-morbid conditions will be randomized to one of the two treatment groups. The study duration (based upon a target accrual rate of 5.1 patients/month/clinic) is fixed at 4.5 years with a 0.5 year closeout period.

NTIS

Emphysema; Respiratory System; Pulmonary Functions; Lungs

20010021742 Puerto Rico Univ., Medical Services, San Juan, Puerto Rico

Missed Opportunities for Pneumocystis Carinii Pneumonia (PCP) Prevention: Failure to Adhere to USPHS PCP Prophylaxis Guidelines and Epidemiology of PCP among Puerto Ricans with HIV Infection ***Final Report***

Zorrilla, Carmen D., Puerto Rico Univ., Puerto Rico; May 16, 2000; 26p; In English

Contract(s)/Grant(s): 200-97-0628

Report No.(s): PB2001-102579; CDC-97E-102; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This study explores individual and social factors associated with patients' decision to initiate and adhere to HIV treatment regimens and Prophylaxis for Pneumocystis carinii (PCP). Data was collected from HIV patients from three Community-Based Organizations (CBO's) and Women of HIV Clinic at San Juan, Puerto Rico. A Focus Group interview was utilized to collect the informations. Questions included information about knowledge, experiences, opinions and recommendations about HIV medical treatments and prevention of PCP. The mean age of participants was 36.9 with a diagnosi ranging from 1985 to 1999. The majority of participant (57%) reported receiving public assistance as a main source of income and most had completed high school and reported "some years if cikkege" (66%). These have been several medical treatments developed to improve the quality of life for people living with HIV. Participants reported they had full knowledge of the latest modalities of treatments and most were excited about the availability of antiretroviral therapy but not all were currently utilizing the antiretroviral regiments. One important concern to participants is the side effects such as severe gastritis, kidney problems, diahrrea, nausea, and anemia. The principal reasons identified by the participants for taking treatments as prescribed were: accessibility, medicine free of charge, positive medication results, confidentiality, family support, co-worker support and after work services offered by clinic's staff, and participation in CBO's programs.

NTIS

Social Factors; Pneumonia; Prophylaxis; Acquired Immunodeficiency Syndrome; Human Immunodeficiency Virus

20010021751 Naval Medical Research Inst., Immune Cell Biology Program, Bethesda, MD USA

Inflammatory Cytokines IFN-Gamma Plus TNF-Alpha Induce Regulated Expression of CD80 (B7-1) But Not CD86 (B7-2) on Murine Fibroblasts

Pechold, Klaus, Naval Medical Research Inst., USA; Patterson, Noelle B., Naval Medical Research Inst., USA; Craighead, Nancy, Naval Medical Research Inst., USA; Lee, Kevin P., Naval Medical Research Inst., USA; June, Carl H., Naval Medical Research Inst., USA; Harlan, David M., Naval Medical Research Inst., USA; Journal of Immunology; [1997]; ISSN 0022-1767, pp. 4921-4929; In English

Contract(s)/Grant(s): EW.0095.003.1412

Report No.(s): AD-A384570; Copyright; Avail: Defense Technical Information Center (DTIC)

Optimal T cell activation requires signal delivered via both the TCR and the costimulatory receptors. Considerable experimental data now suggest that this costimulatory signal is generated predominately by CD28 when engaged by its ligands CD80 (B7-1) and/or CD86 (B7-2). Whether T cell activation is controlled in part by regulated CD80 and/or CD86 expression has been incompletely explored. Here, we report that CD80 can be expressed constitutively by murine fibroblasts and up-regulated after treatment with IFN-lambda plus TNF-alpha. CD80 expression and function was confirmed by (1) Northern analysis, (2) specific immuno-precipitation of a approx. 69-kDa surface protein that comigrated with CD80 precipitated from CD80-transfected CHO cells, and (3) two independent assays for costimulation of Ag-specific T cell activation. Taken together, these observations suggest that CD28/CTLA-4 ligands are expressed on a wider variety of tissues than previously expected and thta their expression is dynamically regulated. Consequently, these results might explain previous observations that inflammatory cytokines can result in autoimmune responses.

Author

Proteins; Ligands; Cells

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

20010020171 Walter Reed Army Inst. of Research, Div. of Neuropsychiatry, Washington, DC USA

Effects of Sleep Schedules on Commercial Motor Vehicle Driver Performance *Final Report*

Balkin, T., Walter Reed Army Inst. of Research, USA; Thome, D., Walter Reed Army Inst. of Research, USA; Sing, H., Walter Reed Army Inst. of Research, USA; Thomas, M., Walter Reed Army Inst. of Research, USA; Redmond, D., Walter Reed Army Inst. of Research, USA; May 2000; 406p; In English

Contract(s)/Grant(s): DTFH61-94-Y-00090

Report No.(s): PB2001-101769; No Copyright; Avail: CASI; A04, Microfiche; A18, Hardcopy

This project was comprised of two studies-a field study using wrist actigraphy to determine sleep duration and timing in long- versus short-haul CMV drivers over 20 consecutive days; and a sleep/dose/response (SDR) laboratory study on CMV drivers to determine the effects of 3, 5, 7, and 9 hours time in bed (TIB) on performance (included simulated driving) over seven consecutive days. Findings from the latter (SDR) study were used to optimize the parameters of the Walter Reed Sleep Performance Model (SPM)-a mathematical algorithm to predict performance based on prior sleep and circadian rhythm. The SPM has been integrated into the current version of the Sleep Watch Actigraph, a wrist-worn device for management of sleep and performance in the operational environment. In Chapter 1, theoretical background on the nature of sleep loss-induced performance decrements is presented. Chapter 2 provides the methodology used in the SDR (laboratory) study, and the detailed results of that study. Chapter 3 provides the background for SPM development, and a detailed description of the SPM. Chapter 4 presents the methodology used in the field study, and the detailed results of that study. Chapter 5 provides an overview and synthesis of results, conclusions, and recommendations.

NTIS

Performance Prediction; Operator Performance; Motor Vehicles; Sleep; Human Behavior

20010020455 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Aviator Inexperience, *6 Aug. 1999 - 2 Jun. 2000*

Gayler, William K., Army Command and General Staff Coll., USA; Jun. 02, 2000; 75p; In English

Report No.(s): AD-A383838; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This study is an analysis of the adequacy of the current aviation training doctrine. Over the last ten years, aviator experience levels have decreased. This erosion of experience has an enormous impact on aviation unit readiness and the readiness of the US

Army. The study is supported by an overview of the perceived inexperience. It quantifies this lack of experience with statistics and facts that, in fact, identify an actual inexperience problem. This thesis analyzes the current Aircrew Training Program to determine if the Aircrew Training Program adequately applies the principles of training found in Field Manual (FM) 25-101. This thesis draws several conclusions. First, a disconnect exists between the Aircrew Training Program and the principles of training outlined in FM 25-101. Second, the Combined Arms Training Strategy lacks 'teeth'. The document fails to provide regulatory guidance to the field; therefore, much of the necessary training is not performed. Third, current simulation devices do not adequately train aviators to the needed fidelity necessary to maintain aviator proficiency. Aviation training is hard, but it must be done. The Army cannot afford to sacrifice standards. The cost of failure is too great. Aviators must be ready when called upon. Many soldiers depend on aviators to be proficient and decisions today can ensure that they are not let down.
Author
Aircraft Pilots; Education; Experience; Human Performance

20010020456 Army Command and General Staff Coll., Fort Leavenworth, KS USA
Is Army Aviation Doctrine Adequate for Military Operations Other Than War?, *6 Aug. 1999 - 2 Jun. 2000*
Tolmachoof, Mark A., Army Command and General Staff Coll., USA; Jun. 02, 2000; 88p; In English
Report No.(s): AD-A383853; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

This thesis is a study of Army aviation doctrine and its suitability for military operations other than war (MOOTW). It uses four case studies of operations in which Army aviation played a significant role: (1) Operation Restore Hope in Somalia, (2) United Nations Operations in Somalia (UNOSOM II); (3) Operation Uphold Democracy in Haiti, and (4) Operations Joint Guard and Joint Endeavour in Bosnia-Herzegovina. The case studies analyze the missions conducted during these operations and highlight the challenges encountered as well as the applicable doctrine, where it exists. The thesis continues with an analysis of aviation doctrine and its guidance for operations other than war. This thesis concludes that Army aviation doctrine is only partially adequate for MOOTW. It provides a sound basis but is lacking in some respects. Many doctrinal combat missions are easily employed in a MOOTW environment. Some, however, are executed so differently that the doctrinal guidance proves to be inadequate. Further still, there are missions for which there is no doctrinal basis. The thesis recommends updating doctrine to reflect the realities of military operations other than war.
Author
Military Operations; Military Aviation

20010020503 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA
Mars Analog Field Training of Astronauts
Rice, James W., Jr., Arizona Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 261-262; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The latest high resolution Mars Orbiting Camera (MOC) images reveal that Mars has had a very complex and rich geological history. This new and exciting discovery is perhaps best illustrated in the imagery which shows abundant layering in the walls of canyons, channels, craters, and scarps. Clearly, these types of sites can only be fully investigated and properly sampled by astronauts. Additionally, any thorough search for extinct and or extant life will have to be carried out by astronauts. This will involve great surface mobility, flexibility, deep subsurface drilling, and intelligence in the field; activities best accomplished by astronauts. Some of the ideas expressed in this paper are from being a member of the joint NASA/LPI sponsored workshop on Mars Field Geology, Biology, and Paleontology held November, 1998 in Houston. The purpose of this workshop was to formulate recommendations that would ultimately contribute to NASA policy regarding human exploration of Mars. Participants included world class field geologists, geochemists, biologists, paleontologists, Apollo astronauts who explored the Moon, the scientists who trained them, Space Shuttle and future Space Station astronauts, NASA/JSC EVA Office, and NASA mission planners.
Author
Mars Surface; Mars (Planet); Planetary Geology; Mission Planning; Manned Mars Missions; Astronaut Training

20010021098
Fiscal 1997 report on the R and D under consignment from NEDO on human sensory measurement application technology
Mar. 31, 1998; 579p; In Japanese; In English
Report No.(s): DE99-707621; ETDE/JP-99707621; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The paper outlined the result of the fiscal 1997 R and D on 'human sensory measurement application technology (HSMAT)' which entered into the second stage. As to the R and D of technology for development of human sensory indices, examples for developing human sensory indices were set up for the following each technology to be developed, and measuring experiments were conducted: technology to assess the effect on physiological senses such as fatigue and awakening, technology to assess

human adaptability to various environmental conditions, and technology to assess adaptability of products to humans from a viewpoint of affinity, etc. In relation to the R and D of technology for practical application of human sensory indices, a study was conducted of application examples for using each index to the design of daily products and residential/working environments, and at the same time a prototype database of human sensory data was trially made using part of the experimental data. Moreover, for clothes and working environment to feel better, design/assembly were conducted of a hand/leg movable and sit-on-chair manikin which enables rational estimation of thermal sense of humans.
NTIS
Research and Development; Human Factors Engineering; Sensory Perception; Robots

20010021286 Federal Aviation Administration, Flight Standards Service, Washington, DC USA
Aviation Instructor's Handbook
1999; 154p; In English
Report No.(s): PB2000-102827; FAA-H-8083-9; No Copyright; Avail: CASI; A02, Microfiche; A08, Hardcopy

The Aviation Instructor's Handbook is designed for ground instructors, flight instructors, and aviation maintenance instructors. It is developed by the Flight Standards Service, Airman Testing Standards Branch in cooperation with aviation educators and industry. This handbook provides the foundation for beginning instructors to understand and apply the fundamentals of instructing. This handbook also provides aviation instructors with up-to-date information on learning and teaching, and how to relate this information to the task of conveying aeronautical knowledge and skills to students. Experienced aviation instructors also may find the new and updated information useful for improving their effectiveness in training activities.
NTIS
Handbooks; Instructors; Aeronautics

20010021368 Institute for Human Factors TNO, Soesterberg, Netherlands
Direction Estimation with Vibro-Tactile Stimuli Presented to the Torso: A Search for the Tactile Ego-Centre ***Final Report***
Het Waarnemen van Richting via Tactiele Stimulatie van de Torso: een Zoektocht naar het Tactiele Egocentrum
vanErp, J. B. F., Institute for Human Factors TNO, Netherlands; Dec. 18, 2000; 46p; In English
Contract(s)/Grant(s): TNO Proj. 788.1
Report No.(s): TD-2000-0336; TM-00-B012; Copyright; Avail: Issuing Activity

The purpose of the present experiments is to investigate whether observers are able to estimate direction with a vibro-tactile stimulus on the torso, and if so, to investigate the accuracy and systematic error. In laboratory studies subjects wore a tactile display on the torso, consisting of a horizontal, linear array of tactile actuators (a tactile belt). Through the positioning of a visual cursor in the same horizontal plane as the belt, they indicated the estimated direction of the tactile stimulus. Observers experience no problems to estimate the direction of tactile stimulus. The systematic error in the estimations shows the existence of two internal reference points about 8 cm apart, one for each side of the torso. The apparent location illusion can double the resolution of the display. The variability in the perceived directions is the smallest around the sagittal plane, with a SD of 4 deg, comparable to that with a visual display. A vibro-tactile display worn on the torso is suited to present direction information in the sagittal plane.
Derived from text
Estimates; Torso; Touch; Skin (Anatomy)

20010021705 Civil Aeromedical Inst., Oklahoma City, OK USA
Latent Trait Theory Analysis of Changes in Item Response Anchors ***Final Report***
Farmer, William L., Civil Aeromedical Inst., USA; Thompson, R. C., Civil Aeromedical Inst., USA; Heil, M. C., Civil Aeromedical Inst., USA; Heil, S. K. R., Oklahoma Dept. of Mental Health and Substance Abuse Services, USA; February 2001; 24p; In English
Contract(s)/Grant(s): AM-B-99-HRR-516
Report No.(s): DOT/FAA/AM-01/4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study was to evaluate the effect that modifications in item response anchors have on responses to survey items. Twenty-nine items were administered in 1993 and 1995 as part of more extensive attitude surveys to two random samples of Federal Aviation Administration employees. Changes in the response scales (5-point Likert) between the two survey administrations ranged from no change at all to extensive re-anchoring of the response categories. Item responses were modeled via two-parameter graded response models based on item response theory. Changes in the way the item responses functioned between both years were assessed using the differential item functioning (DIF) method recommended by Muraki. Twenty-four of the 29 items displayed significant levels of DIF, indicating that the response categories did not measure the constructs of interest in a similar fashion across the two administrations. Items whose response anchors had been changed substantially exhibited significant DIF

more frequently than those where the change in anchors was less drastic. These results suggest that researchers and practitioners take a conservative approach when considering the revision of measuring scales for a particular set of items.
Author
Human Behavior; Evaluation; Responses

20010021706 Institute for Human Factors TNO, Soesterberg, Netherlands
Training Teams with Simulated Teammates: Outline of a Research Program ***Final Report***
Schaafstal, A. M., Institute for Human Factors TNO, Netherlands; Jan. 15, 2001; 60p; In English; Original contains color illustrations
Contract(s)/Grant(s): 60052; TNO Proj. 790.2
Report No.(s): TD-2000-0342; TNO-TM-01-B001; Copyright; Avail: Issuing Activity

Training teams is an expensive endeavor, partly because the involvement of a large amount of role-players and training staff involved in training exercises. If it happens that not all members of the team are available for an exercise, then often the roles of missing team members are taken by either fellow classmates or members of the training staff. This does not necessarily enhance the quality of training. Training with simulated teammates may result in ”anytime anywhere on demand training”, at a lower cost. For on-board training situations, this may be a very useful option, since usually there will not be an extensive training staff on board of naval ships. The development of simulated teammates depends upon the development of more extensive, better architectures, but on the other hand, the question is how models that will be developed in these architectures, should behave. This report details a strategy to answer the latter question. On the basis of a literature study, hard thinking and further discussions with experts in the field, a sketch of the complete field of teamtraining development, organization and delivery is outlined. The sketch is used to pinpoint those aspects where the use of simulated teammates could be useful and what further research is needed to implement these roles. The results show that a number of research areas can be distinguished: requirements and guidelines at the task level, the instructional level, performance measurement and feedback level, but also when and how simulated teammates may be incorporated into the training. For each of these areas, research questions were developed. The resulting research program is outlined. The program should result in guidelines for training teamwork skills, with or without the aid of simulated teammates and in guidelines for the behavior of computational models of simulated teammates. It is concluded that it is wise to start with guidelines and requirements for simulated teammates in the areas of instructional capabilities and strategies, performance measurement and feedback. to enable the research, experimental research will be carried out using the DDD-testbed, in which participants will either be trained with or without simulated teammates. These simulated teammates however, are not executable cognitive models, but confederates of the experimenter: people behaving according to a tight script.
Author
Education; Teams; Training Analysis; Training Evaluation

20010021708 Institute for Human Factors TNO, Soesterberg, Netherlands
Cross Training and The Functioning of Teams With Different Structures ***Teamprocessen en teamprestatie: het effect van cross-training op het functioneren van teams werkend met een open en gesloten taakstructuur***
Schaafstal, A. M., Institute for Human Factors TNO, Netherlands; Jan. 05, 2001; 54p; In Dutch
Contract(s)/Grant(s): B00-052
Report No.(s): TD-2000-0338; TM-00-B013; Copyright; Avail: Issuing Activity

Is it possible to obtain a significant improvement of training outcome by training teams that are working in different environments by different instructional strategies which have been adapted to their environment? Experimental research was conducted in a laboratory-set up. We used TANDEM, a low-fidelity testbed for investigating command-and-control issues. Teams working in an open and closed environment were trained with an interaction-specific and an interaction-generic strategy. Team performance was measured, but apart from that, we measured communication variables. The results show that teams that have been trained with an interaction-specific strategy communicate less than teams that have been trained with an interaction-generic strategy, although the latter teams in general perform well. In general, in line with earlier research, high-performing teams communicate more and provide each other with more feedback than low-performing teams. The idea that training teams that have to work in a certain environment, with a strategy that is customized to that environment is a promising one. However, it is not yet fully understood which strategy fits best onto which environment. Follow-on studies should focus not just on performance measures, but should also incorporate to a fuller extent team dimensions, such as information exchange, communication, supporting behaviour and initiative/leadership.
Author
Education; Communication; Human Relations; Human Performance

20010021746 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada

The Relative Impact of Generic Head-Related Transfer Functions and Signal Bandwidth on Auditory Localization: Implications for the Design of Three-Dimensional Audio Displays

Arrabito, G. R.; Mendelson, J. R.; Dec. 04, 2000; 83p; In English

Report No.(s): AD-A385635; DCIEM-TR-2000-067; Copyright; Avail: Defense Technical Information Center (DTIC)

Virtual auditory technology is being considered to cue armoured vehicle or air crew, via headphones of the communication system, to the spatial locations of potential lethal threats. Auditory localization in virtual auditory space (VAS) on the horizontal plane was investigated in this paper as a function of seven generic head-related transfer functions (i.e., digital filters for synthesizing the location of a sound in VAS), signal bandwidth (low-pass 3 kHz, high-pass 3 kHz and low-pass 14 kHz), and listening environment (quiet and in the presence of diffuse ambient Leopard tank noise). Testing was also conducted in the free-field which partially served to psychoacoustically validate the VAS conditions. The outcome of this preliminary study revealed that subject performance was better in free-field than in VAS. In the latter condition, subject performance was not significantly affected by type of generic head-related transfer function. Localization accuracy using the broadband stimulus was not significantly better than with the low-pass 3 kHz stimulus. Performance in the quiet condition was relatively better than in the noise condition. The implications of these results for implementation of a 3-D audio display into military environments and recommendations for future research are discussed.

DTIC

Transfer Functions; Display Devices; Auditory Perception; Satellite Sounding; Atmospheric Sounding; Virtual Reality

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..

20010020169 Federal Aviation Administration, Advanced Automation Program Office, Washington, DC USA

Advanced Automation System, Voice Switching Control System, Console Equipment, Man-Machine Interface Requirements *Final Report*

Jul. 01, 1985; 28p; In English

Report No.(s): PB2001-102167; FAA-VS-AAP-001; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This document sets forth the Voice Switching and Control System (VSCS) functional requirements which must be accommodated by the Man-Machine Interface (MMI) design of those VSCS elements to be installed in the Advanced Automation System (AAS) Common Console. The AAS contractors are to design the VSCS MMI to satisfy the requirements in this document and to be compatible with the AAS MMI design. The VSCS contractors will, in turn, design hardware and software which satisfies that MMI design.

NTIS

Man Machine Systems; Automatic Control; Computer Programs; Equipment Specifications

20010020186 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA

Aviator's Night Vision Imaging System HUD: An Analysis of its Application to Naval Helicopters

Peters, D.; Oct. 16, 1995; 25p; In English

Report No.(s): AD-A385398; NAWCADPAX--95-100-TM; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Combat Search and Rescue (CSAR) helicopter pilots routinely utilize Night Vision Goggles to enhance visual capabilities during night operations. The Aviator's Night Vision Imaging System (ANVIS) HUD, recently tested on the HH-60H Seahawk, provides the capability to display critical flight parameters to the pilots via goggle-mounted display units, thus minimizing head-down time in the cockpit. As more and more Naval helicopter missions diversify to include CSAR and CSAR support, devices which effectively enhance night mission performance should be made available to the mission pilots. This report describes the developmental testing results of the ANVIS HUD system and critically analyzes its advantages and limitations for use in Naval helicopters. In addition, ANVIS HUD symbology is examined from a human factors perspective with recommendations for symbology design and placement.

DTIC

Night Vision; Goggles; Visual Acuity

20010020195 Nanyang Technological Univ., School of M and P Engineering, Nanyang, Singapore
4th Asia-Pacific Conference on Human Computer Interaction (APCHI 2000) and 6th Southeast Asian Ergonomics Society Conference (ASEAN Ergonomics 2000)
Dec. 04, 2000; 502p; In English; 4th; 6th; Human Computer Interaction, 27 Nov. - 1 Dec. 2000, Singapore, Singapore
Contract(s)/Grant(s): F62562-00-M-9104; F62562-00-M-9100
Report No.(s): AD-A385460; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche

The proceedings of the 4th Asia-Pacific Conference on Human Computer Interaction (APCHI 2000) and 6th Southeast Asian Ergonomics Society Conference (ASEAN Ergonomics 2000) is presented. Technological areas discussed include: Part 1- Keynote Addresse; Part 2- Industrial Ergonomics; Part 3- Process Control; Part 4- Physical Ergonomics; Part 5- Military Ergonomics; Part 6- Human Computer Interaction; Part 7- Ergonomics Tools, Techniques & Policy; Part 8- Human Factors of Product Design; Part 9- Ergonomics of Safety; Part 10- Human Factors of E-Commerce; Part 11- Ergonomics in Action: The Case of Indonesia; and, Part 12- Poster Papers.
DTIC
Human-Computer Interface; Conferences; Human Factors Engineering

20010020204 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway: Volume 11, Number 1
Barbato, Greg; Metzler, Tom; Singer, Rebecca; Newell, Alan; Mar. 2000; 17p; In English; Original contains color plates
Contract(s)/Grant(s): SPO700-98-D-4001
Report No.(s): AD-A385529; CSERIAC-GWXI1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This issue contains articles on the following topics: (1) Uninhabited Combat Air Vehicle Controls and Displays for Suppression of Enemy Air Defenses; (2) The New Director of CSERIAC; (3) Human Systems Integration Technologies, Tools, and Techniques (HSIT3); (4) Designing for Extra-ordinary People and Situations; and (5) Leveraging the Technical Area Task (TAT) Program.
DTIC
Systems Integration; Human Factors Engineering; Drone Vehicles

20010020276 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway: Volume 10, Number 2, 1999
Miller, James C.; Knott, Benjamin; Campbell, Gwendolyn; Harper, Steve; Nov. 1999; 17p; In English; Original contains color plates
Contract(s)/Grant(s): SPO700-98-D-4001
Report No.(s): AD-A385359; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This issue contains articles on the following topics: (1) A Conceptual Framework for the Estimation of Worker Fatigue; (2) Human Factors in Urban Operations; (3) Modelling Human Performance on the Road to Manpower Optimization; and (4) Virtual Analysis of Aircraft Cockpits.
DTIC
Human Factors Engineering; Fatigue (Biology); Human Performance

20010020277 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway: Volume 9, Number 3, 1998
Bogner, Marilyn S.; Fineberg, Michael; Gershon, Nahum; Caretti, David M.; Feb. 1999; 13p; In English; Original contains color plates
Contract(s)/Grant(s): SPO700-98-D-4001
Report No.(s): AD-A385360; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This issue contains articles on the following subjects: (1) Warnings in Health Care; (2) Using a General Theory of Behavior (GTB) to predict the Effects of Suppressive Fires; (3) Information Visualization: The Next Frontier; and (4) Modelling the Effects of Respirator Mask Design on Wearer Performance.
DTIC
Human Factors Engineering; Respirators; Health

20010020278 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway: Volume 11, Number 3, 2000
Fineberg, Michael; Boff, Kenneth; Chapanis, Alphonse; Rouse, William; Oct. 2000; 21p; In English; Original contains color plates
Contract(s)/Grant(s): SPO700-98-D-4001
Report No.(s): AD-A385361; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This special issue features classic gateway articles and some observations from the Human Systems IAC chief scientist. The classic articles include: (1) Integrating Ergonomics into Systems Design; (2) Making Human Factors Truly Human Factors; (3) Human-Centered Design: Creating Successful Products, Systems, and Organizations; and (4) Naturalistic Decision Making.
DTIC
Human Factors Engineering; Decision Making

20010020312 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway: Volume 11, Number 2
Sebrechts, Marc M.; Knott, Benjamin; Matzke, Nika; Haas, Michael W.; Jul. 2000; 21p; In English; Original contains color plates
Contract(s)/Grant(s): SPO700-98-D-4001
Report No.(s): AD-A385531; CSERIAC-GWXI2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This issue features articles on Virtual Reality research and applications. Subjects include: (1) Using Virtual Environments for Training of Spatial Navigation; (2) Virtual Environment Technology for Training; (3) Warfighter-centered Virtual Reality Technology; (4) Simulator Sickness in Virtual Environments; and (5) Potential Rehabilitation Benefits of Virtual Reality.
DTIC
Computerized Simulation; Virtual Reality; Flight Simulation; Motion Simulation; Training Simulators; Flight Simulators; Motion Sickness

20010020313 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway: Volume 9, Number 1
Rastikis, Laima; Fineberg, Michael; Kolleck, Matt; Endsley, Mica; Jun. 1998; 17p; In English; Original contains color plates
Contract(s)/Grant(s): SPO700-98-D-4001
Report No.(s): AD-A385530; CSERIAC-GWIX1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This issue contains articles on the following subjects: (1) Human-Centered Design Project Revolutionizes Air Combat; (2) Situation Awareness, Automation, and Decision Support: Designing for the Future; and (3) Environmental Physiology and Human Performance Laboratory.
DTIC
Human Factors Engineering; Helmet Mounted Displays; Air Defense; Combat

20010020369 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway, Volume 8
Carter, Richard J.; Schopper, Aaron; Tyrol, Douglas; Salvendy, Gavriel; Feb. 1998; 17p; In English
Contract(s)/Grant(s): SPO900-94-D-0001
Report No.(s): AD-A385472; CSERIAC-GWVIII2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This issue contains articles on the following subjects: (1) Data Acquisition System for Motor-Vehicle Crash Avoidance Research; (2) US Army Research Laboratory: Human Research and Engineering Directorate; (3) Designing for Physical, Cognitive, and Social Attributes in Human Computer Interaction; and (4) Examining the Concept of Total Fidelity Flight Simulation.
DTIC
Data Acquisition; Human-Computer Interface; Human Factors Engineering

20010020414 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway, Volume 6
Flach, John M.; Hann, Reuben L.; Schopper, Aaron; Weghorst, Suzanne; May 1996; 13p; In English
Contract(s)/Grant(s): SPO900-94-D-0001
Report No.(s): AD-A385474; CSERIAC-GWVI6; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This issue contains articles on the following subjects: (1) Situation Awareness: In Search of Meaning; and (2) Human Factors at the Human Interface Technology Laboratory.
DTIC
Human Factors Engineering; Human-Computer Interface

20010020415 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway, Volume 7
Long, Mary L.; Olson, Gary M.; Hann, Reuben L.; Filler, Dennis L.; Dec. 1996; 17p; In English
Contract(s)/Grant(s): SPO900-94-D-0001
Report No.(s): AD-A385475; CSERIAC-GWVII1; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
This issue contains articles on the following subjects: (1) Concerns for a Multicultural Crew Aboard the International Space Station; (2) Technological Support for Distributed Work Groups; (3) A Conversation with Gary Olson; and (4) The FAA Technical Center: Research Development and Human Factors Laboratory.
DTIC
Spacecrews; International Cooperation; Human Factors Laboratories

20010020445 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway: Volume 7, Number 4
Militello, Laura G.; Schopper, Aaron; Taylor, Robert; Muniz, Elizabeth J.; May 1997; 21p; In English
Contract(s)/Grant(s): SPO900-94-0001
Report No.(s): AD-A385528; CSERIAC-GWVII4; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This issue contains articles on the following subjects: (1) Cognitive Task Analysis: Bringing a Powerful Tool into Wide Use; (2) Human Factors Tools: What Art Thou? and How Do We Find (and Select) Thee?; (3) Cognitive Compatibility and Aircrew System Design; and (4) Naval Warfare Center Training System Division: Science and Technology Division.
DTIC
Human Factors Engineering; Research and Development

20010020446 Crew System Ergonomics Information Analysis Center, Wright-Patterson AFB, OH USA
Gateway: Volume 7, Number 3
Roscoe, Stanley N.; Schopper, Aaron; Amalberti, Rene; Vicente, Kim; Feb. 1997; 17p; In English
Contract(s)/Grant(s): SPO900-94-D-0001
Report No.(s): AD-A385527; CSERIAC-GWVII3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This issue contains articles on the following subjects: (1) Horizon control Reversals and the Graveyard Spiral; (2) When Human Errors Serve Safety Goals; (3) The Cognitive Engineering Laboratory at The University of Toronto; (4) Situational Awareness in the Tactical Air Environment. (5) Synthesized Immersion Research Environment (SIRE).
DTIC
Human Factors Engineering; Human-Computer Interface; Virtual Reality

20010020757 Michigan Univ., Transportation Research Inst., Ann Arbor, MI USA
Display of Short Text Messages on Automotive HUDs: Effects of Driving Workload and Message Location, *Sep. 1999 - Apr. 00*
Tsimhoni, O., Michigan Univ., USA; Watanabe, H., Michigan Univ., USA; Green, P., Michigan Univ., USA; Friedman, D., Michigan Univ., USA; Oct. 2000; 58p; In English
Report No.(s): PB2001-102212; UMTRI-2000-13; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report describes the second in a series of studies to identify best locations for presenting various types of information on a simulated head-up display (HUD). In the current study 16 participants drove a simulator on roads with curves of several different radii while responding to messages appearing at 1 of 8 locations on a HUD. Two types of information were presented on the HUD. In the reading condition, participants indicated the gender (male, female) of a first name shown on the HUD. In the detection condition, participants responded as soon as a name (scrambled) appeared. Response time to messages increased with the horizontal eccentricity of the HUD location. The center positions (straight ahead) had mean response times of 110 ms, whereas the outer positions (10 degrees to either side) had mean response times of 1250 ms. In contrast to reading time, detection time was not signif-

icantly affect by where the message appeared. Driving performance was only degraded when the HUD appeared at the center position.
NTIS
Head-Up Displays; Messages; Human Performance; Workloads (Psychophysiology)

20010020760 Battelle Human Factors Transportation Center, Seattle, WA USA
Human Factors Design Guidelines for Advanced Traveler Information Systems (ATIS) and Commercial Vehicle Operations (CVO), *1 Oct. 1992 - 1 Mar. 1998*
Campbell, J. L., Battelle Human Factors Transportation Center, USA; Carney, C., Battelle Human Factors Transportation Center, USA; Kantowitz, B. H., Battelle Human Factors Transportation Center, USA; Sep. 1998; 298p; In English; Original contains color illustrations
Contract(s)/Grant(s): DTFH61-92-C-00102
Report No.(s): PB2001-100373; FHWA-RD-97-057; Copyright; Avail: National Technical Information Service (NTIS)

Significant advances in electronics and microcomputing during the past few decades have led to the feasibility of a functionally powerful, computer-based ATIS as part of the automotive environment. Although these systems range in functionality, they all have the goal of acquiring, analyzing, communicating, and presenting information to assist travelers in moving from a starting location to a desired destination. While systems under development or in production promise to improve travel safety, efficiency, and comfort, they represent a new frontier in ground transportation. This handbook is intended to address a growing information gap between the advanced and diverse status of automotive technologies such as ATIS devices, and the availability of human factors design criteria that can be used during the system design process. Specifically, while ATIS and CVO systems offer great potential benefits, their effectiveness depends on driver acceptance of the new technology, the ability of the systems to integrate the information with other driving tasks, and the extent to which the systems conform to driver physical and cognitive limitations and capabilities. The handbook summarizes human engineering data, guidelines, and principles for use by creative designers, engineers and human factors practitioners during the ATIS design process.
NTIS
Human Factors Engineering; Information Systems; Systems Engineering; Design Analysis; Urban Transportation

20010021211 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
An Evaluation of Vector Geospatial Databases in Cockpit Moving-Map Displays to Improve Pilot Performance
Lohrenz, Maura C.; Trenchard, Michael E.; Myrick, Stephanie A.; Edwards, Stephanie S.; Aug. 24, 2000; 9p; In English
Report No.(s): AD-A385439; NRL/PP/7440--00-0014; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Today's military pilots are bombarded with information from moving-maps and other advanced cockpit displays. Current moving-map displays in the AV-8B Harrier and F/A-18 Hornet naval aircraft are based on scanned aeronautical charts, which are familiar to pilots but present an unalterable - and sometimes illegible - display. When mission-planning symbols (i.e., targets, threats, routes, etc.) are overlaid on these scanned-map displays, the result can be extremely cluttered. In contrast, the advent of 'vector' geospatial databases offers the potential for customized moving-maps, in which user-specified geospatial features can be layered (with or without a base-map, such as satellite imagery) to suit specific mission requirements. The primary disadvantage of vector-based cockpit moving maps is the potential for increased pilot workload, unless these new map displays are carefully designed for the target user.
DTIC
Harrier Aircraft; Display Devices; Cockpits; Charts; Maps; Human Factors Engineering; F-18 Aircraft

20010021289 National Inst. of Standards and Technology, Building and Fire Research Lab., Gaithersburg, MD USA
Development of a Dynamic Compression Test Apparatus for Measuring Thermal Performance of Fighters' Protective Clothing
Lawson, J. Randall, National Inst. of Standards and Technology, USA; Twilley, William H., National Inst. of Standards and Technology, USA; Malley, Kevin S., New York City Fire Dept., USA; Apr. 2000; 74p; In English
Report No.(s): PB2000-105743; NISTIR-6502; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

A dynamic compression test apparatus has been developed that bases its design on fire ground conditions that produce burn injuries to the knees of fire fighters. This apparatus may be used to measure the thermal performance of fire fighters' protective clothing in either wet or dry thermal environments. Studies conducted by the New York City Fire Department (FDNY) show that the contact surface area of the human knee is approximately 3710 sq mm (5.75 sq in) for a male fire fighter with a body mass of about 79 kg (74 lbs). In addition, the FDNY shows that a fully equipped 79 kg (174 lb) fire fighter operating a charged 44.5 mm (1 3/4 in) hoseline had a mean average knee compression, force per unit area, of 133 kPa (19.3 lbf/sq in). The test apparatus and

operating procedures discussed in this report take these data into consideration. Test results show that the compression apparatus can discriminate between various levels of thermal performance for fire fighters' protective clothing knee pad systems. In addition, results from the apparatus show that knee pad systems can have significantly different thermal performance when exposed to wet and dry thermal conditions.
NTIS
Protective Clothing; Fire Fighting; Compression Tests; Burns (Injuries); Temperature Effects; Measuring Instruments

20010021490 Institute of Aviation Medicine, Beijing, China
Analysis of a New Type Active Noise Cancellation Earmuffs
Yu, Wen-Bin, Institute of Aviation Medicine, China; Liu, Sen, Institute of Aviation Medicine, China; Hao, Dong-Xian, Institute of Aviation Medicine, China; Zheng, Xue-Wen, Institute of Aviation Medicine, China; Space Medicine and Medical Engineering; Dec. 2000; ISSN 1002-0837; Volume 13, No. 6, pp. 448-450; In Chinese; Copyright; Avail: Issuing Activity

To study a new type feedback Active Noise Cancellation Earmuff (ANCE). The mathematical model of such a structure was established based on frequency response function and automatic control theory. Equations representing principles of ANCE was derived. The method and rule for designing ANCE controllers were summarized and the optimum design method was used for designing the controllers. The acoustic components and simulated circuit were well matched. One of the prototypes can attenuate the noise more than 15 dB in the frequency range of 50-2000 Hz (19 dB highest). The Noise Cancellation value of this earmuff achieved international level of 1990s and could be mass produced.
Author
Mathematical Models; Automatic Control; Frequency Response; Noise (Sound)

20010021551 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
A Foggy Start: Determining the Effect of Eyewear Fogging on Visual Task Performance
Sloan, R.; Crebolder, J. M.; Tyler, R.; Aug. 01, 2000; 46p; In French
Contract(s)/Grant(s): Proj. L2646
Report No.(s): AD-A385588; DCIEM-TR-2000-097; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

To evaluate the effect of fogging of eyewear on task performance and to assess the effectiveness of an anti-fog coating, nine participants completed a visual search task under conditions simulating the two most likely occurrences of eyewear fogging. In the static environment, participants performed a visual search task while seated in front of a computer terminal. The eyewear was cold soaked in a cooler prior to being donned to simulate moving from a cold exterior to a warm interior environment. In the exercise environment, simulating exercising in the cold, participants performed the task in a cooled climatic chamber while pedaling a cycle ergometer. In this environment the eyewear was not cold soaked but was donned prior to entering the chamber. All participants performed the visual search task in static and exercise environments under three conditions: wearing no eyewear (bare-eye), wearing eyewear that had been treated with an anti-fog coating (coated eyewear) and wearing eyewear that had not been treated with anti-fog coating (uncoated eyewear). Each condition was video recorded and participants' subjective evaluations of the degree of fogging were collected at regular intervals throughout the task. Accuracy and speed of response were collected as performance measures on the visual search task. In the static environment fogging occurred on the uncoated eyewear immediately after it was removed from the cooler and continued for up to two minutes into the visual search task. Coated eyewear also fogged on six of the nine participants but for a much shorter period of time. Participants were significantly more accurate in performing the task while in the bare-eye and coated eyewear conditions compared to the uncoated condition. No effect of response time was evident but slowest responses were observed in the bare-eye condition. It is proposed that practice in performing the task was a contributing factor in this finding.
DTIC
Climatology; Eye (Anatomy); Visual Tasks; Human Performance; Fog; Protective Coatings

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EXOBIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see 52 Aerospace medicine; on animals and plants see 51 Life Sciences. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science.

20010020468 NASA Goddard Space Flight Center, Greenbelt, MD USA
Cooperative Robotics and the Search for Extraterrestrial Life
Lupisella, M. L., NASA Goddard Space Flight Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 198-199; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

If we think tenuous abodes of life may be hiding in remote extraterrestrial environmental niches, and if we want to assess the biological status of a given locale or entire planet before sending humans (perhaps because of contamination concerns or other motivations) then we face the challenge of robotically exploring a large space efficiently and in enough detail to have confidence in our assessment of the biological status of the environment in question. On our present schedule of perhaps two or so missions per opportunity, we will likely need a different exploratory approach than singular stationary landers or singular rover missions or sample return, because there appear to be fundamental limitations in these mission profiles to obtain the many samples we will likely need if we want to have confidence in assessing the biological status of an environment in which life could be hiding in remote environmental niches. Singular rover missions can potentially accommodate sampling over a fairly large area, but are still limited by range and can be a single point of failure. More importantly, such mission profiles have limited payload capabilities which are unlikely to meet the demanding requirements of life-detection. Sample return has the advantage of allowing sophisticated analysis of the sample, but also has the severe limitations associated with only being able to bring back a few samples. This presentation will suggest two cooperative robotic approaches for exploration that have the potential to overcome these difficulties and facilitate efficient and thorough life-detecting exploration of a large space. Given the two premises stated above, it appears at least two fundamental challenges have to be met simultaneously: (1) coverage of a large space and (2) bringing to bear a sophisticated suite of detection and experimental payloads on any specific location in order to address a major challenge in looking for extraterrestrial life: namely, executing a wide variety of detection scenarios and in situ experiments in order to gather the required data for a confident assessment that life has been detected and to, more generally, cover a wide range of extraterrestrial life possibilities. Cooperative robotics lends itself to this kind of problem because cooperation among the combined capabilities of a variety of simple single function agents can give rise to fairly complex task execution such as the search for and detection of extraterrestrial life.
Author
Extraterrestrial Life; Robotics; Detection; Mission Planning

20010020499 NASA, Washington, DC USA
Impact Crater Hydrothermal Niches for Life on Mars: Question of Scale
Pope, K. O., Geo Eco Arc Research, USA; Ames, D. E., Geological Survey of Canada, Canada; Kieffer, S. W., S. W. Kieffer Science Consulting, Inc., Canada; Ocampo, A. C., NASA, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 253-254; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

A major focus in the search for fossil life on Mars is on ancient hydrothermal deposits. Nevertheless, remote sensing efforts have not found mineral assemblages characteristic of hydrothermal activity. Future remote sensing work, including missions with higher spatial resolution, may detect localized hydrothermal deposits, but it is possible that dust mantles will prohibit detection from orbit and lander missions will be required. In anticipation of such missions, it is critical to develop a strategy for selecting potential hydrothermal sites on Mars. Such a strategy is being developed for volcanogenic hydrothermal systems, and a similar strategy is needed for impact hydrothermal systems.
Author
Mars (Planet); Extraterrestrial Life; Fossils; Craters; Mission Planning; Mars Missions

20010020527 Alabama Univ., Dept. of Physics, Birmingham, AL USA
In-Situ Instrumentation for Exobiological Objectives on Mars: Devices, Protocols and Strategies
Wdowiak, T. J., Alabama Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 306-307; In English; See also 20010020461; Sponsored in part by Planetary Instrument Definition and Development Program (PIDDP), the Athena Rover Integrated Science Project, and the Astrobiology Program; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The 'life' issue is the most provocative driver for the exploration of Mars, therefore several dicta are necessary. These are: (1) Prior to specific 'life search' activities it is imperative that understanding Mars as a planet, particularly its ancient nature, is a first condition; (2) Proper instrumentation for serving exobiological objectives must be first capable of producing high level planetary science. Highly specialized instruments must be avoided, particularly those of the 'test strip' variety. The mistake of the 'life search' instrumentation package of the Viking missions must not be repeated; (3) Instrumentation that elucidates molecular structure is highly suited for both high level planetary science and exobiology objectives; (4) The most desirable architecture is one that organizes several instruments into an integrated suite to maximize tasking - create 'an orchestra'; and (5) The NASA SP-530 'An Exobiological Strategy for Mars Exploration' remains an excellent basis for planning. For the past decade the Astro and Solar System Physics Program of the University of Alabama at Birmingham (UAB) has been engaged in the definition and development of planetary surface instruments directed toward exobiological objectives. Experience with the miniaturization of both Mossbauer and Raman spectrometers, developing an impact tool that is the equivalent of a geologist's rock hammer for robotic obtaining of fresh surfaces, and currently addressing how to do time-of-flight mass spectroscopy on Europa has resulted in a perspective that is, for the most part, one of the undertaking instrumentation development to meet scientific objectives rather than tailoring prior interests to 'fit in'. Since May 1997 considerable effort has been expended in the development of the Athena Raman Spectrometer which is a joint project of Washington University, UAB, and JPL.
Author
Exobiology; Mars Surface; Mars Missions; Mission Planning; Spacecraft Instruments; Extraterrestrial Life

20010020528 Lunar and Planetary Inst., Houston, TX USA
Life on Mars: What and Where?
Westall, Frances, Lunar and Planetary Inst., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 308-309; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The search for life on Mars has gathered momentum since McKay et al's publication concerning possible life in a martian meteorite. In this contribution, I present my opinion of what to look for and where based on my own studies of fossil bacteria in the context of the early history of life on Earth. My premise is that the search for extraterrestrial life needs to take place within a planetary context. I first analyse what is known about the context for the origin of life on Earth and what we understand about the first fossil organisms. Then I will briefly compare the early terrestrial environment to that of Mars. Finally I will consider what to look for in the search for life on Mars, and likely environmental locations.
Author
Mars (Planet); Exobiology; Extraterrestrial Life; Fossils

59
MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see categories 60 through 67.

20010020684
PROGS2H4-the program for solving the boundary problem for the system of differential equations
Zemlyanaya, E. V.; Puzynin, I. V.; Puzynina, T.; Dec. 31, 1998; 19p; In Russian; In English
Report No.(s): DE99-602122; JINR-R-11-97-414; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The description of the computational scheme and procedure realizing the sweep method for solving the system of two ordinary differential equations with 2nd type boundary conditions at the ends points of given interval is represented. The boundary problem is approximated with the help of the difference scheme of O(h(sup 4)) precision on the mesh with constant step h. This problem occurs in schemes of linearity of nonlinear boundary problems (for example, in Newtonian iterative schemes), and represented.
NTIS
Boundary Value Problems; Differential Equations

20010021011
Numerical study of one-dimensional replicating patterns in reaction-diffusion systems with non-linear diffusion coefficients
Ferreri, J.; Carmen, A.; Dec. 31, 1998; 16p; In English; 10th; Numerical Methods and its Applications, Unknown
Report No.(s): DE98-636096; ARN-PI-6/98; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A numerical study of the dynamics of pattern evolution in reaction-diffusion systems is performed, although limited to one spatial dimension. The diffusion coefficients are nonlinear, based on powers of the scalar variables. The system keeps the dynamics of previous studies in the literature, but the presence of nonlinear diffusion generates a field of strong nonlinear interactions due to the presence of receding travelling waves. This field is limited by the plane of symmetry of the space domain and the last born outgoing travelling wave. These effects are discussed.
NTIS
Diffusion Coefficient; Nonlinearity; Reaction-Diffusion Equations; Numerical Analysis; Mathematical Models

20010021012
Stability analysis of single-phase thermosyphon loops by finite difference numerical methods
Ambrosini, W.; Ferreri, J. C.; Dec. 31, 1998; 13p; In English; 18th; Passive Safety Features in Nuclear Installations, Unknown
Report No.(s): DE98-636094; ARN-PI-4/98; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper, examples of the application of finite difference numerical methods in the analysis of stability of single-phase natural circulation loops are reported. The problem is here addressed for its relevance for thermal-hydraulic system code applications, in the aim to point out the effect of truncation error on stability prediction. The methodology adopted for analysing in a systematic way the effect of various finite difference discretization can be considered the numerical analogue of the usual techniques adopted for PDE stability analysis. Three different single-phase loop configurations are considered involving various kinds of boundary conditions. In one of these cases, an original dimensionless form of the governing equations is proposed, adopting the Reynolds number as a flow variable. This allows for an appropriate consideration of transition between laminar and turbulent regimes, which is not possible with other dimensionless forms, thus enlarging the field of validity of model assumptions.
NTIS
Stability; Finite Difference Theory; Numerical Analysis; Thermosiphons; Single-Phase Flow

60
COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 Electronics and Electrical Engineering. For computer vision see 63 Cybernetics, Artificial Intelligence and Robotics.

20010021150
Report on research and development of a brain type computer architecture 'trial fabrication and high-level evaluation on chips for a large-scale artificial neural system' and on results of evaluation studies on the chips, *FY 1997*
Mar. 31, 1998; 273p; In Japanese
Report No.(s): DE99-707607; ETDE/JP-99707607; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In order to develop a brain type computer architecture, a brain mimic processor (BMP) has been developed (which was made in LSI in fiscal 1997), and studies are being made on developing its applications. Development has been made on an element in which linkage of one million cells with one thousand neural cells can be realized. Evaluation substrates mounted with the BMP, control software, and compilers were provided to 15 organizations including the National Research Institutes, universities, corporations, and other societies (for 19 themes) to evaluate capability of the LSI and its application development. All of the research organizations are using these items utilizing features of the LSI or the network for such purposes as learning, storage, recognition and control. The applicable theme may include infrared spectrum pattern recognition and domain division of document images using neural network functions. It can also include structural analysis of mass spectrum molecules, time series pattern recognition, location of corresponding points in images, estimation of moving images, satellite control, character recognition, short time storage, long-term association memory models, and invention process studies, all utilizing the functions of the BMP.
NTIS
Architecture (Computers); Artificial Intelligence; Chips (Electronics); Microprocessors

20010021524 Sandia National Labs., Albuquerque, NM USA
Evolving the Web-Based Distributed SI/PDO Architecture for High-Performance Visualization
Holmes, V. P.; Linebarger, J. M.; Miller, D. J.; Vandewart, R. L.; Crowley, C. P.; Aug. 16, 2000; 7p; In English
Report No.(s): DE00-761871; SAND2000-2071C; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Simulation Intranet/Product Database Operator (SI/PDO) project has developed a Web-based distributed object architecture for high performance scientific simulation. A Web-based Java interface guides designers through the design and analysis cycle via solid and analytical modeling, meshing, finite element simulation, and various forms of visualization. The SI/PDO archi-

tecture has evolved in steps towards satisfying Sandia's long-term goal of providing an end-to-end set of services for high fidelity full physics simulations in a high-performance, distributed, and distance computing environment. This paper describes the continuing evolution of the architecture to provide high-performance visualization services. Extensions to the SI/PDO architecture allow web access to visualization tools that run on MP systems. This architecture makes these tools more easily accessible by providing web-based interfaces and by shielding the user from the details of these computing environments. The design is a multi-tier architecture, where the Java-based GUI tier runs on a web browser and provides image display and control functions. The computation tier runs on MP machines. The middle tiers provide custom communication with MP machines, remote file selection, remote launching of services, load balancing, and machine selection. The architecture allows middleware of various types (CORBA, COM, RMI, sockets, etc.) to connect the tiers depending upon the situation. Testing of constantly developing visualization tools can be done in an environment where there are only two tiers which both run on desktop machines. This allows fast testing turnaround and does not use compute cycles on high-performance machines. Once the code and interfaces are tested, they are moved to high-performance machines, and new tiers are added to handle the problems of using these machines. Uniform interfaces are used throughout the tiers to allow this flexibility. Experiments test the appropriate level of interface: either a large set of specific function calls or a small set of generic function calls. This architecture is based on the goals and constraints of the environment: huge data volumes (that cannot be easily moved), use of multiple middleware protocols, MP platform portability, rapid development of the visualization tools, distributed resource management (of MP resources), and the use of existing visualization tools.
NTIS
Scientific Visualization; Data Bases; Architecture (Computers); Internets

20010021626 Sandia National Labs., Albuquerque, NM USA
ASCI Network for SC '99: A Step on the Path to a 100 Gigabit Per Second Supercomputing Network
Pratt, T. J.; Tarman, T. D.; Martinez, L. M.; Miller, M. M.; Adams, R. L.; Jul. 24, 2000; 22p; In English
Report No.(s): DE00-760016; SAND2000-1812; No Copyright; Avail: Department of Energy Information Bridge

This document highlights the Discom(sup 2)'s Distance computing and communication team activities at the 1999 Supercomputing conference in Portland, Oregon. This conference is sponsored by the IEEE and ACM. Sandia, Lawrence Livermore and Los Alamos National laboratories have participated in this conference for eleven years. For the last four years the three laboratories have come together at the conference under the DOE's ASCI, Accelerated Strategic Computing Initiatives rubric. Communication support for the ASCI exhibit is provided by the ASCI DISCOM(sup 2) project. The DISCOM(sup 2) communication team uses this forum to demonstrate and focus communication and networking developments within the community. At SC 99, DISCOM built a prototype of the next generation ASCI network demonstrated remote clustering techniques, demonstrated the capabilities of the emerging Terabit Routers products, demonstrated the latest technologies for delivering visualization data to the scientific users, and demonstrated the latest in encryption methods including IP VPN technologies and ATM encryption research. The authors also coordinated the other production networking activities within the booth and between their demonstration partners on the exhibit floor. This paper documents those accomplishments, discusses the details of their implementation, and describes how these demonstrations support Sandia's overall strategies in ASCI networking.
NTIS
Supercomputers; Computer Networks

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COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20010020187 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA
Designs and Lessons Learned in Object-Oriented Web-Based Mapping
Wilson, Ruth; McCreedy, Frank; Ladner, Roy; Chung, Miyi; Shaw, Kevin; Oct. 27, 2000; 14p; In English; Pub. in Proceedings of Southern Conference on Computing, Mississippi, 26-28 Oct 2000.
Report No.(s): AD-A385400; NRL/PP/7440--00-1012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents a summary of designs used in developing an object-oriented web-based mapping application. The Web Mapping Toolkit (WMT) is a Java applet which accesses mapping data from the Geospatial Information Database (GIDB). The GIDB is an object-oriented database developed by the Naval Research Laboratory which stores multiple data types from many sources. The motivation for development of the WMT is to allow users to access geographical data over the Internet through a web browser, without the necessity of specialized software or hardware. Main topics of discussion for the design of the WMT will

include choice of programming languages and data transfer protocols, object-oriented design applied to mapping, use of object-oriented pointers for efficient retrieval, interface definition language (idl) design choices, and factors associated with map display. Lessons learned throughout the design process will also be presented.
DTIC
Information Retrieval; Information Systems; Object-Oriented Programming

20010020251 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Explicit Substitutions and All That
Ayala-Rincon, Mauricio; Munoz, Cesar; Nov. 2000; 23p; In English
Contract(s)/Grant(s): NAS1-97046
Report No.(s): AD-A385383; ICASE-2000-45; NASA-CR-2000-210621; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Explicit substitution calculi are extensions of the lambda-calculus where the substitution mechanism is internalized into the theory. This feature makes them suitable for implementation and theoretical study of logic-based tools such as strongly typed programming languages and proof assistant systems. In this paper we explore new developments on two of the most successful styles of explicit substitution calculi: the lambda sigma- and lambda S(e)-calculi.
DTIC
Calculus; Calculi; Substitutes

20010020274 Naval Postgraduate School, Monterey, CA USA
Data Integrity Limitations in Hybrid Security Architectures ***Progress Report, 1 June 00-1 Dec. 00***
Irvine, Cynthia E.; Levin, Timothy E.; Dec. 2000; 22p; In English
Report No.(s): AD-A385357; NPS-CS-00-008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We discuss a class of computer/network architectures that supports multilevel security and commercial applications, while utilizing primarily commercial-off-the-shelf (COTS) workstations, operating systems and hardware components. We show that a property of these architectures is that, while they are capable of supporting multilevel confidentiality policies, they do not generally support partially ordered integrity policies: specifically, these architectures do not support the maintenance of data that is higher in integrity than the integrity level of the COTS components, thus limiting their applicability to processing environments where the integrity of data is consistent with that of low-assurance software.
DTIC
Security; Architecture (Computers)

20010020350 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Validation and Verification of Formal Specifications in Object-Oriented Software Engineering
Thomson, Steven A.; Sep. 2000; 209p; In English
Report No.(s): AD-A385658; AFIT/GE/ENG/00S-01; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The use of formal specifications allows for a software system to be defined with stringent mathematical semantics and syntax via such tools as propositional calculus and set theory. There are many perceived benefits garnered from formal specifications, such as a thorough and in-depth understanding of the domain and system being specified and a reduction in user requirement ambiguity. Probably the greatest benefit of formal specifications, and that which is least capitalized upon, is that mathematical proof procedures can be used to test and prove internal consistency and syntactic correctness in an effort to ensure comprehensive validation and verification (V & V).
DTIC
Program Verification (Computers); Computer Programming; Software Development Tools; Object-Oriented Programming; Software Engineering

20010020437 Ohio State Univ., Columbus, OH USA
TAILSIM Users Guide ***Final Report***
Hiltner, Dale W., Ohio State Univ., USA; December 2000; 30p; In English
Contract(s)/Grant(s): NAG3-2007; RTOP 711-21-23
Report No.(s): NASA/CR-2000-210560; NAS 1.26:210560; E-12512; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The TAILSIM program uses a 4th order Runge-Kutta method to integrate the standard aircraft equations-of-motion (EOM). The EOM determine three translational and three rotational accelerations about the aircraft's body axis reference system. The

forces and moments that drive the EOM are determined from aerodynamic coefficients, dynamic derivatives, and control inputs. Values for these terms are determined from linear interpolation of tables that are a function of parameters such as angle-of-attack and surface deflections. Buildup equations combine these terms and dimensionalize them to generate the driving total forces and moments. Features that make TAILSIM applicable to studies of tailplane stall include modeling of the reversible control System, modeling of the pilot performing a load factor and/or airspeed command task, and modeling of vertical gusts. The reversible control system dynamics can be described as two hinged masses connected by a spring. resulting in a fifth order system. The pilot model is a standard form of lead-lag with a time delay applied to an integrated pitch rate and/or airspeed error feedback. The time delay is implemented by a Pade approximation, while the commanded pitch rate is determined by a commanded load factor. Vertical gust inputs include a single 1-cosine gust and a continuous NASA Dryden gust model. These dynamic models. coupled with the use of a nonlinear database, allow the tailplane stall characteristics, elevator response, and resulting aircraft response, to be modeled. A useful output capability of the TAILSIM program is the ability to display multiple post-run plot pages to allow a quick assessment of the time history response. There are 16 plot pages currently available to the user. Each plot page displays 9 parameters. Each parameter can also be displayed individually. on a one plot-per-page format. For a more refined display of the results the program can also create files of tabulated data. which can then be used by other plotting programs. The TAILSIM program was written straightforwardly assuming the user would want to change the database tables, the buildup equations, the output parameters. and the pilot model parameters. A separate database file and input file are automatically read in by the program. The use of an include file to set up all common blocks facilitates easy changing of parameter names and array sizes.
Author
Computer Programs; User Requirements; Aircraft Icing; Data Bases; Dynamic Models; In-Flight Simulation; Control Stability

20010020441 Missouri Univ., Rolla, MO USA
Run-Time Assurance for Distributed Computing Systems ***Final Report, 1 Sep. 1993 - 31 Oct. 1997***
McMillin, B. M.; Nov. 27, 2000; 4p; In English
Contract(s)/Grant(s): F49620-93-1-0409
Report No.(s): AD-A385568; AFRL-SR-BL-TR-01-0005; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This work, as an AASERT Augmentation to F49620-92-J-0546, has developed a powerful concept in evaluating formal specifications concurrently with distributed program execution for the purposes of error detection, fault tolerance, and security. This concept is realized in the CCSP evaluation system for axiomatic proofs, for interval temporal formulae, and for a security calculus. We have validated this concept through nontrivial examples of distributed programs including a dynamic group membership protocol, a distributed database scheduler, of a responsive system modeling railroad trains on intersecting tracks, and of a secure warehouse management system. Moreover, the spinoff technologies from this work, in of themselves have become useful. CCSP can also be used as a debugging tool for distributed programs. Properties used in CCSP can be visualized using abstract glyphs. Both of these achievements may help to bring more use of formal methods into the mainstream.
DTIC
Parallel Processing (Computers); Program Verification (Computers); Fault Tolerance

20010020762 Defence Science and Technology Organisation, Maritime Operations Div., Melbourne Australia
STAS-SWISS Time Series Analysis Software
Jackson, Trevor R.; Nguyen, Binh; Jones, Adrian D.; Clarke, Paul A.; Aug. 2000; 103p; In English; Original contains color plates
Report No.(s): AD-A385469; DSTO-TR-1033; DODA-AR-011-551; Copyright; Avail: Defense Technical Information Center (DTIC)

This report describes the function, features and method of operation of the STAS (SWISS Time Series Analysis Software) software package which has been prepared for the analysis of ocean environmental acoustic data collected during the Shallow Water In-Situ Survey (SWISS) series of trials. The software is capable of analysing sonobuoy trials data to determine the ocean ambient noise level spectrum, transmission loss as a function of range and frequency, and reverberation level as a function of time and frequency at the trials site. The use of the software is illustrated with at-sea input data. The correct function of the software is indicated by the use of test data time series for which the analysis results are known.
DTIC
Time Series Analysis; Computer Programs; Underwater Acoustics; Shallow Water; Software Development Tools

20010020859 Naval Postgraduate School, Monterey, CA USA

Implementation and Integration of the Object Transaction Service of CORBA to Java Application Database Program

Hazir, Yildiray, Naval Postgraduate School, USA; March 2000; 125p; In English

Report No.(s): AD-A378651; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

In examining the recent trend of the Client/Server computing technology, it can be seen that distributed object technology is ready to take off. The CORBA (Common Object Request Broker) architecture is the most widely known and readily available candidate for development. For this reason (CORBA has attracted our attention. The OMG (Object Management Group), a consortium of object venders, developed the CORBA standard in the fall of 1990 as a common interconnection bus for distributed objects. Transaction processing is useful not only in database applications but also in building robust mission-critical applications. Utilizing CORBA one can build reliable distributed software system in a much easier way. CORBA is the most widely accepted standard in this field and there are many CORBA implementations available now. Moreover, the transaction concept is the key to ensure the reliability and availability of Client/Server applications. In this thesis transaction properties were applied to a database application program based on Naval Post Graduate School's Course Iteration System. For this purpose an Object Transaction Service was provided based upon the CORBA architecture. It takes advantage of object-oriented programming to help programmers implement transactional applications in a much easier way. In late 1994, the OMG also published the specification for the object transaction service. This specification is adopted as the blue print for this study. This thesis presents the implementation and integration of the object transaction service based on CORBA. JDBC (Java Database Connection) was not used for transaction property, because JDBC is currently limited in that it cannot manage transactions across multiple connections. For transaction support across databases or object services, CORBA's Transaction Service provides the best level of abstraction.

DTIC

Java (Programming Language); Applications Programs (Computers); Data Bases; Object-Oriented Programming; Computation

20010021088

Overview of human media technology R and D, *FY 1997*

Mar. 31, 1998; 291p; In Japanese

Report No.(s): DE99-707614; ETDE/JP-99707614; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper reports a summary of results in fiscal 1997 of research and development of human media technology. Fiscal 1997 launched design and trial fabrication of the following items: interface to improve efficiency and safety of plant operators, accommodation of multimedia contents to aid Kansei design, city development design aiding technologies using contents retrieval and presentation technologies and virtual reality, and empirical evaluation technologies for safety, comfort and convenience. Specific study assignments were extracted on a virtual media technology, a Kansei media technology and a knowledge media technology being three elementary technologies for human media to make clear the research and development approaches to be taken in the coming fiscal years. In addition, a human media technology committee, a research and development working group, and an investigation working group were established. Also launched were investigations on research trends in the human media technology, and investigative researches on contacts of information needs in industries with human media.

NTIS

Multimedia; Computer Aided Design

20010021133 NASA Langley Research Center, Hampton, VA USA

A Bell-Curved Based Algorithm for Mixed Continuous and Discrete Structural Optimization

Kincaid, Rex K., College of William and Mary, USA; Weber, Michael, Cigital, Inc., USA; Sobieszczanski-Sobieski, Jaroslaw, NASA Langley Research Center, USA; [2001]; 10p; In English; 42nd; Structures, Structural Dynamics and Materials, 16-20 Apr. 2001, Seattle, WA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAG1-2077

Report No.(s): AIAA Paper 2001-1550; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

An evolutionary based strategy utilizing two normal distributions to generate children is developed to solve mixed integer nonlinear programming problems. This Bell-Curve Based (BCB) evolutionary algorithm is similar in spirit to (mu + mu) evolutionary strategies and evolutionary programs but with fewer parameters to adjust and no mechanism for self adaptation. First, a new version of BCB to solve purely discrete optimization problems is described and its performance tested against a tabu search code for an actuator placement problem. Next, the performance of a combined version of discrete and continuous BCB is tested

on 2-dimensional shape problems and on a minimum weight hub design problem. In the latter case the discrete portion is the choice of the underlying beam shape (I, triangular, circular, rectangular, or U).
Author
Design Analysis; Nonlinear Programming; Design Optimization

20010021353 Osaka City Univ., Faculty of Engineering, Japan
Feature-Point Tracking Evaluation Method
Ruan, Xiang, Osaka City Univ., Japan; Zhang, Haihong, Osaka City Univ., Japan; Hama, Hiromitsu, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 87-92; In English; Copyright; Avail: Issuing Activity

Feature point tracking is a very important problem in 3D reconstruction research area. We propose here a new method that expand the algorithm adopted by Carlo Tomasi and Takeo Kanade. In this paper, we first introduce the tracking method adopted by Tomasi and Kanade. The method still has something that should be improved. The main problem is real-time-checking wrong tracking. Our method can expand their method, and can increase the precision of their method. It is based on histogram theory and image gradient theory. We also show some simulation result in this paper to prove the validity of our method.
Author
Three Dimensional Models; Reconstruction; Tracking (Position)

20010021397 Eidgenoessische Technische Hochschule, Inst. of Computational Sciences, Zurich, Switzerland
Multiobjective Optimization Using Evolutionary Algorithms
Sbalzarini, Ivo F., Eidgenoessische Technische Hochschule, Switzerland; Mueller, Sibylle, Eidgenoessische Technische Hochschule, Switzerland; Koumoutsakos, Petros, Eidgenoessische Technische Hochschule, Switzerland; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 63-74; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Multiobjective evolutionary algorithms for shape optimization of electrokinetic micro channels have been developed and implemented. An extension to the Strength Pareto Approach that enables targeting has been developed. The results of the automated optimization cycle show shapes previously obtained by physical understanding as well as novel shapes of even higher efficiency.
Author
Genetic Algorithms; Optimization; Microchannels

20010021508 Los Alamos National Lab., NM USA
Research Software Development Based the Exploratory Process Model (EXP)
Ambrosiano, J.; Peterson, M. M.; Dec. 22, 2000; 40p; In English
Report No.(s): PB2001-102974; LA-UR-00-3697; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper addresses the problem of software development in scientific research settings. These are settings that often seem intransigent to software engineering recommendations. We believe this can be explained by the exploratory nature of research, which makes requirements development and planning particularly problematic. Here we suggest a new approach based on an exploratory process model that resembles optimization heuristics. This is a departure from current standards that are strongly based on engineering and manufacturing process models. We call this model EXP. The EXP model offers a plausible account of software practice priorities shown in surveys of scientists and engineers who develop simulation and analysis software in R&D projects.
NTIS
Software Development Tools; Computer Programming; Research and Development; Software Engineering; Computer Systems Simulation

20010021527 Sandia National Labs., Albuquerque, NM USA
Windows NT Workstation Performance Evaluation Based on Pro/E 2000i BENCHMARK
Davis, S. M.; Aug. 02, 2000; 11p; In English
Report No.(s): DE00-761843; SAND2000-1946C; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A performance evaluation of several computers was necessary, so an evaluation program, or benchmark, was run on each computer to determine maximum possible performance. The program was used to test the Computer Aided Drafting (CAD) ability of each computer by monitoring the speed with which several functions were executed. The main objective of the benchmarking program was to record assembly loading times and image regeneration times and then compile a composite score that could be

compared with the same tests on other computers. The three computers that were tested were the Compaq AP550, the SGI 230, and the Hewlett-PackardP750C. The Compaq and SGI computers each had a Pentium III 733mhz processor, while the Hewlett-Packard had a Pentium III 750mhz processor. The size and speed of Random Access Memory (RAM) in each computer varied, as did the type of graphics card. Each computer that was tested was using Windows NT 4.0 and Pro/ENGINEER(trademark) 2000i CAD benchmark software provided by Standard Performance Evaluation Corporation (SPEC). The benchmarking program came with its own assembly, automatically loaded and ran tests on the assembly, then compiled the time each test took to complete. Due to the automation of the tests, any sort of user error affecting test scores was virtually eliminated. After all the tests were completed, scores were then compiled and compared. The Silicon Graphics 230 was by far the overall winner with a composite score of 8.57. The Compaq AP550 was next with a score of 5.19, while the Hewlett-Packard P750C performed dismally, achieving a score of 3.34. Several factors, including motherboard chip set, graphics card, and the size and speed of RAM, were involved in the differing scores of the three machines. Surprisingly the Hewlett-Packard, which had the fastest processor, came back with the lowest score. The above factors most likely contributed to the poor performance of the Hewlett-Packard. Based on the results of the benchmark test, the SGI 230 appears to be the best CAD software solution. The Hewlett-Packard most likely performed poorly due to the fact that it was only running a 100mhz Front Side Bus (FSB), while the SGI machine was running at a 133mhz. The Compaq was using a new type of RAM called RDRAM. While this RAM was at first perceived to be a great performer, various benchmarks, including this one, have found that the computers using RDRAM really only achieve average performance.
NTIS
Workstations; Computer Aided Design; Windows (Computer Programs); Performance Tests

20010021535 Ljubljana Univ., Faculty of Electrical Engineering, Ljubljana, Slovenia
Using Statistical Moments for Digit Recognition ***Uporaba Statisticnih Momentov za Razpoznavo Stevk***
Mutec, Matevz, Ljubljana Univ., Slovenia; Tasic, Jurij F., Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 289-293; In Slovene; Copyright; Avail: Issuing Activity

The main goal of this paper is to show the possibility of using the invariant moments for the recognition of the ten Arabic digits (0-9). Before starting the recognition procedure, the picture is segmented into separate regions called snippets. These separate segmented regions consist of only isolated pictures of the ten digits. to avoid the computationally very complicated and time-consuming process of segmentation, an assumption is now made that these isolated snippets are available prior to the recognition procedure. The first step in the algorithm is to calculate the Hu's invariant moments. by inverting the picture brightness prior to the computation of the moments, these moments become invariant to the digit,s possible horizontal/vertical. The second step is to classify our picture into ten (10) digit classes as proposed. Each font type has differently shaped digits therefore the Hu's moments may vary from one font type to another. The Hu's moments may even vary when using differently sized fonts This simply implies that the same font, when used in a different size, does not retain its geometric proportions. It is in the nature of the Hu's invariant moments that they are invariant to rotation. This feature is taken advantage of when dealing with recognition and detection of only one single pattern, whereas when recognizing ten different digits it exhibits some severe disadvantages. The worst problem is found with the digits 6 and 9, which share the same Hu's moments (digit 6 is digit 9 turned around). to solve this problem, a simple but effective algorithm is used. The digit recognition is a useful tool for various commercial companies in their dealing with automatic invoice registration and recognition. This paper presents results of a real project.
Author
Statistical Analysis; Distribution Moments; Digits

20010021536 Ljubljana Univ., Faculty of Electrical Engineering, Ljubljana, Slovenia
A System for Tracking Players in Sports Games by Computer Vision ***Sistem za Sledenje Igralcev v Sportnih Igrah s Pomocjo Racunalniskega Vida***
Pers, Janez, Ljubljana Univ., Slovenia; Kovacic, Stanislav, Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 281-288; In English; Copyright; Avail: Issuing Activity

We present a computer vision system for tracking players in indoor team games, e.g. handball in our particular case. We describe several image processing and tracking methods. along with camera calibration and lens distortion correction. The output of the system consists of spatio-temporal trajectories of the players, which can be further processed and analyzed by sport experts. We present some experimental results as well.
Author
Computer Vision; Games; Image Processing

20010021537 Ljubljana Univ., Faculty of Computer and Information Science, Ljubljana, Slovenia

How to Exploit Multiprocessing Features of the SGI Origin 200 ***Kako Izrabljati Vecprocesorske Znacilnosti Sistema SGI Origin 2000***

Bulic, Patricio, Ljubljana Univ., Slovenia; Gustin, Veselko, Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 275-280; In English; Copyright; Avail: Issuing Activity

In this paper we present some approaches to writing parallel codes on the SGI Origin 200 multiprocessor. In practice, the largest piece of the code-parallelization process is still left to the programmer, with some help from the compiler and the operating system. With the SGI Origin system, in particular, the programmer has to find the pieces of code which can be done in parallel, and the synchronization is also the responsibility of the programmer. The problem we focused on in writing parallel codes, is the synchronization of multiprocessor access to the same memory location. In this paper, some principles of synchronization are described and analysed. We show how the execution time depends on each of these approaches. The results of testing the micro-benchmark, indicate that synchronization performs very poorly under the heavy traffic. We show, that in such cases it is better to leave our code to execute in serial on a single processor.

Author

Multiprocessing (Computers); Synchronism; Computer Programs; Parallel Processing (Computers)

20010021538 Ljubljana Univ., Fakulteta za Racunalnistvo in Informatiko, Ljubljana, Slovenia

Do We Know the Microprocessor Pentium III? ***Ali Poznamo Mikroprocesor Pentium III?***

Gustin, Veselko, Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 268-274; In Slovene; Copyright; Avail: Issuing Activity

The paper focuses mainly on the Intel's PC microprocessor family from the Tab. 1. Our main interest is to present the Pentium III specialities, such as addressing of the 64 G bytes main memory, running modes, different modes of flexible paging, level two (L-2) cache memory, multimedia instruction set (MNIX), and streamed SIMI) (Single Instruction Multiple Data) instruction set (SSE). We introduce the idea of SIMD processing by two examples.

Author

Microprocessors; Memory (Computers); Performance Tests

20010021539 Maribor Univ., Fakulteta za Elektrotehniko, Racunalnistvo in Informatiko, Maribor, Slovenia

Analysis of Design Patterns ***Analiza Vzorcev Nacrtovanja***

Domajnko, Tomaz, Maribor Univ., Slovenia; Rozman, Ivan, Maribor Univ., Slovenia; Hericko, Marjan, Maribor Univ., Slovenia; Vajde-Horvat, Romana, Maribor Univ., Slovenia; Juric, Matjaz B., Maribor Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 261-267; In Slovene; Copyright; Avail: Issuing Activity

Object technology promotes reuse as one of the key factors of success. During the last couple of years, reuse on a higher level of abstraction has been the key area of research in the field of software reuse. Especially well covered is the field of software design where the focus is on publication of design pattern catalogs. But the growing number of the design patterns could lead to a point where all the advantages would be lost. A great number of catalogs tend to specify the same patterns under different names, whereas patterns with the same names have a different meaning in some situations. This leads to divergent vocabulary, although design patterns should consolidate it. The same Situation is with design patterns as a tool for documenting software designs - their growing number diminishes their value. These are the reasons why we have to avoid enlarging the number of design patterns by forming a firm set of basic design patterns. Such a foundation is a starting point where the definition of new design patterns can begin. to reach the goal, we present thorough analysis of design pattern catalogs. We define a set of criteria which classify design patterns into four main categories (ground design patterns {TVN}. language dependent design patterns {KVN} related design patterns {RVN}, and object oriented idioms {-:-}. Only the set of the basic design patterns can be defined as pure design patterns. Language dependent design patterns present language constructs that are presented in a form of design patterns. Related design patterns present patterns that can be described as an application or variation of ground design patterns. Object oriented idioms present basic knowledge a skilled software engineer should have. We define yet another criterion: the design pattern specification precision. by using these criteria we identify a set of design pattern specifications that should be revised and enhanced. Results of our analysis are presented in two steps. First, we identify design patterns that do not conform to individual criteria and explain the decision. Secondly, we combine partial results into one final table, from which the impact of the set of criteria call clearly be seen.

Author

Design Analysis; Software Reuse; Research

20010021540 Stefan (J.) Inst., Dept. of Intelligent Systems, Ljubljana, Slovenia

Intelligent Agents in E-Commerce ***Inteligentni Agenti v Elektronskem Poslovanju***

Pivk, Aleksander, Stefan (J.) Inst., Slovenia; Gams, Matjaz, Stefan (J.) Inst., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 251-260; In English; Copyright; Avail: Issuing Activity

Intelligent agents represent a new breed of software with a significant potential for a wide range of Internet applications. They have been successfully used for personal assistants, intelligent user interfaces, and managing electronic mail. Recently, agents have been applied to electronic commerce, promising a revolution in the way we conduct business, whether business-to-business, business-to-customer or customer-to-customer. This paper gives a brief introduction into intelligent agents and electronic commerce, followed by a review of agent technologies involved in buying and selling. Typology, taxonomy, and classification of agents are presented. Several agent-mediated electronic commerce systems are analyzed in the context of a general model of the buying process. Several lists of related Internet links should help readers to gather additional relevant information.

Author

Electronic Commerce; Electronic Mail; Internets

20010021541 Ljubljana Univ., Fakulteta za Racunalnistvo in Informatiko, Ljubljana, Slovenia

JavaScript and Simulation of Dynamic Phenomena ***JavaScript in Simulacije Dinamicnih Pojavov***

Divjak, Sasa, Ljubljana Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 246-250; In Slovene; Copyright; Avail: Issuing Activity

The paper presents the advantages using JavaScript functions in interaction with scriptable applets. The concept was tested on JxyZET simulation applet which was developed as a platform independent complement to xyZET, The later is an authoring tool for the development and visualisation of various phenomena in physics. It runs under Motif environment and permits the simulation of flexible bodies built from particles interconnected with springs, In the first part of the paper a short history of JxyZET is given. The original JxyZET was expanded with some scriptable functions. This permits the definition of more complex elastic bodies built from several hundreds or even thousands of particles and springs. These bodies can be easily modified just by changing some parameters within the Javascript code included in the parent hypertext.The simulation of complex dynamic systems is investigated. One such system is given by a halt bouncing on an elastic canvas. The introduction of libraries of reusable JavaScript function was proposed, The usage of Javascript permits the interaction of an user defined algorithm with the simulation tool, in our case JxyZET. The concept of dynamically conditioned simulation runs is explained and the possibilities of dynamically restructured simulation models are demonstrated. This means that during the simulation runs not only the parameters but also the structure of the simulation [node] can be modified, depending on programmable preconditions written in JavaScript. The explained concepts of flexible scriptable functions can be implemented by other similar simulation applets too. In such a way the known nuclear fission reaction was simulated. In the presented example practically all the simulation algorithm was written in Javascript. The presented approach permits very flexible Simulations of large dynamic systems. The major limiting factor is presented by the capabilities of currently available computer technology, in particular their speed.

Author

Algorithms; Computer Systems Design; Computerized Simulation; Environment Simulation

20010021621 National Inst. of Standards and Technology, Manufacturing Engineering Lab., Gaithersburg, MD USA

Interactive Traning through Knowledge Navigation

Moncarz, H. T.; Jan. 2001; 38p; In English

Report No.(s): PB2001-102819; NISTIR-6708; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes the initiation of the authors' project to study three-dimensional navigation through manufacturing knowledge domains suitable for training. In summary the authors are organizing and representing knowledge from the NIST Manufacturing Engineering Laboratory (MEL) and associating that knowledge with virtual objects within a virtual, three-dimensional environment. The authors are using the MEL Shop as a metaphor to represent the top-level spatial structure that houses the virtual objects. The Virtual Reality Modeling Language (VRML) standard plays a key role in the authors' initial work. However, the role of interoperability standards, in general, will be significant in this project, both for implementing the navigational platform and for populating it with manufacturing domain content. The main goal of this paper is to describe the information the authors have studied, their thought process in defining the project, and the preliminary prototype the authors have developed to show their initial ideas.

NTIS

Knowledge; Navigation; Computer Aided Manufacturing

20010021625 Sandia National Labs., Albuquerque, NM USA

Configurable, Object-Oriented, Transportation System Software Framework

Kelly, S. M.; Myre, J. W.; Price, M. H.; Russell, E. D.; Scott, D. W.; Aug. 01, 2000; 84p; In English

Report No.(s): DE00-759368; SAND2000-0729; No Copyright; Avail: Department of Energy Information Bridge

The Transportation Surety Center, 6300, has been conducting continuing research into and development of information systems for the Configurable Transportation Security and Information Management System (CTSS) project, an Object-Oriented Framework approach that uses Component-Based Software Development to facilitate rapid deployment of new systems while improving software cost containment, development reliability, compatibility, and extensibility. The direction has been to develop a Fleet Management System (FMS) framework using object-oriented technology. The goal for the current development is to provide a software and hardware environment that will demonstrate and support object-oriented development commonly in the FMS Central Command Center and Vehicle domains.

NTIS

Computer Programs; Information Management; Object-Oriented Programming; Software Engineering; Management Systems; Transportation

20010021657 California Univ., Dept. of Computer Science, Los Angeles, CA USA

SESAME: Scalable Systems Software Measurement and Evaluation ***Final Report, Oct. 1994 - Feb. 2000***

Kleinrock, Leonard; Bagrodia, Rajive; Popek, Gerald; Aug. 2000; 102p; In English

Contract(s)/Grant(s): F30602-94-C-0273; DARPA Order B549; AF Proj. B549

Report No.(s): AD-A385148; AFRL-IF-RS-TR-2000-120; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The goal of the SESAME project has been to create a set of tools to study the performance of operating systems. This project developed a method for observing component behavior inside the operating system kernel in fully running computers, a method for modeling the effects of changes, and a method for sharing the results among researchers. These have been fully implemented and tested on a massively parallel processing system (MPP). The project has used this implementation to identify details of system operation that were both contrary to documentation, and difficult to establish from user-level observation. In the process, two especially important lessons have been learned. The first is that extracting data from an OS kernel is a very challenging task. Although placing ”diagnostic code” into an OS seems simple enough, to be useful the method must handle the large volumes of data produced without degrading system performance, organize it in a consistent analyzable way, and make the process flexible and extensible enough to allow arbitrary investigations. The method and programming described are substantially portable, and other teams will almost certainly find it much more practical to adapt them, than to undertake a three-year process of reinvention from scratch. The second important lesson is that such invasive, detailed tools are likely best used by inside members of OS development teams, or their quality assurance counterparts. In short, exposing such intimate system behavior can expose trade secrets. The measurement team was bound by a non-disclosure agreement with the vendor, and faced a constant dilemma between its obligations not to disclose protected intellectual property, and pressure from analysts for detailed information.

DTIC

Software Engineering; Quality Control; Evaluation; Parallel Programming; Operating Systems (Computers)

20010021735 Johns Hopkins Univ., Baltimore, MD USA

A Probabilistic Framework for the Validation and Certification of Computer Simulations

Ghanem, Roger, Johns Hopkins Univ., USA; Knio, Omar, Johns Hopkins Univ., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 27-35; In English; Sponsored by NASA, USA

Contract(s)/Grant(s): F30602-00-2-0612; N00014-99-1-0900; N00014-99-1-1038; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The paper presents a methodology for quantifying, propagating, and managing the uncertainty in the data required to initialize computer simulations of complex phenomena. The purpose of the methodology is to permit the quantitative assessment of a certification level to be associated with the predictions from the simulations, as well as the design of a data acquisition strategy to achieve a target level of certification. The value of a methodology that can address the above issues is obvious, specially in light of the trend in the availability of computational resources, as well as the trend in sensor technology. These two trends make it possible to probe physical phenomena both with physical sensors, as well as with complex models, at previously inconceivable levels. With these new abilities arises the need to develop the knowledge to integrate the information from sensors and computer simulations. This is achieved in the present work by tracing both activities back to a level of abstraction that highlights their commonalities, thus allowing them to be manipulated in a mathematically consistent fashion. In particular, the mathematical theory underlying computer simulations has long been associated with partial differential equations and functional analysis concepts such as Hilbert spares and orthogonal projections. by relying on a probabilistic framework for the modeling of data, a Hilbert space framework

emerges that permits the modeling of coefficients in the governing equations as random variables, or equivalently, as elements in a Hilbert space. This permits the development of an approximation theory for probabilistic problems that parallels that of deterministic approximation theory. According to this formalism, the solution of the problem is identified by its projection on a basis in the Hilbert space of random variables, as opposed to more traditional techniques where the solution is approximated by its first or second-order statistics. The present representation, in addition to capturing significantly more information than the traditional approach, facilitates the linkage between different interacting stochastic systems as is typically observed in real-life situations. Author

Approximation; Certification; Computerized Simulation; Data Acquisition; Functional Analysis; Simulation

20010021737 Sandia National Labs., Albuquerque, NM USA

An Approach to Experimental Design for the Computer Analysis of Complex Phenomenon

Rutherford, Brian, Sandia National Labs., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 15-25; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The ability to make credible system assessments, predictions and design decisions related to engineered systems and other complex phenomenon is key to a successful program for many large-scale investigations in government and industry. Recently, many of these large-scale analyses have turned to computational simulation to provide much of the required information. Addressing specific goals in the computer analysis of these complex phenomenon is often accomplished through the use of performance measures that are based on system response models. The response models are constructed using computer-generated responses together with physical test results where possible. They are often based on probabilistically defined inputs and generally require estimation of a set of response modeling parameters. As a consequence, the performance measures are themselves distributed quantities reflecting these variabilities and uncertainties. Uncertainty in the values of the performance measures leads to uncertainties in predicted performance and can cloud the decisions required of the analysis. A specific goal of this research has been to develop methodology that will reduce this uncertainty in an analysis environment where limited resources and system complexity together restrict the number of simulations that can be performed. An approach has been developed that is based on evaluation of the potential information provided for each ”intelligently selected” candidate set of computer runs. Each candidate is evaluated by partitioning the performance measure uncertainty into two components - one component that could be explained through the additional computational simulation runs and a second that would remain uncertain. The portion explained is estimated using a probabilistic evaluation of likely results for the additional computational analyses based on what is currently known about the system. The set of runs indicating the largest potential reduction in uncertainty is then selected and the computational simulations are performed. Examples are provided to demonstrate this approach on small scale problems. These examples give encouraging results. Directions for further research are indicated. Author

Computer Techniques; Experiment Design; Analysis (Mathematics)

20010021738 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Implications of Simulation Conceptual Model Development for Simulation Management and Uncertainty Assessment

Pace, Dale K., Johns Hopkins Univ., USA; JANNAF 1st Modeling and Simulation Subcommittee Meeting; November 2000, pp. 1-13; In English; 1st; Modeling and Simulation Subcommittee, 13-17 Nov. 2000, Monterey, CA, USA; Sponsored by NASA, USA

Contract(s)/Grant(s): N00024-98-D-8124; No Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A simulation conceptual model is a simulation developers way of translating modeling requirements (i. e., what is to be represented by the simulation or its modification) into a detailed design framework (i. e., how it is to be done), from which the software, hardware, networks (in the case of distributed simulation), and systems/equipment that will make up the simulation can be built or modified. A conceptual model is the collection of information which describes a simulation developers concept about the simulation and its pieces. That information consists of assumptions, algorithms, characteristics, relationships, and data. Taken together, these describe how the simulation developer understands what is to be represented by the simulation (entities, actions, tasks, processes, interactions, etc.) and how that representation will satisfy the requirements to which the simulation responds. Thus the conceptual model is the basis for judgment about simulation fidelity and validity for any condition that is not specifically tested. The more perspicuous and precise the conceptual model, the more likely it is that the simulation development will both fully satisfy requirements and allow demonstration that the requirements are satisfied (i. e., validation). Methods used in simulation conceptual model development have significant implications for simulation management and for assessment of simulation uncertainty. This

paper suggests how to develop and document a simulation conceptual model so that the simulation fidelity and validity can be most effectively determined. These ideas for conceptual model development apply to all simulation varieties. The paper relates these ideas to uncertainty assessments as they relate to simulation fidelity and validity. The paper also explores implications for simulation management from conceptual model development methods, especially relative to reuse of simulation components. Author

Algorithms; Simulation

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COMPUTER SYSTEMS

Includes computer networks and distributed processing systems. For information systems see 82 Documentation and Information Science. For computer systems applied to specific applications, see the associated category.

20010020036 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA

Protecting Individuals' Interests in Electronic Commerce Protocols

Wong, Hao C.; Aug. 2000; 171p; In English

Report No.(s): AD-A384879; CMU-CS-00-160; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Commerce transactions are being increasingly conducted in cyberspace. We not only browse through on-line catalogs of products, but also shop, bank, and hold auctions on-line. The general goal of this research is to answer questions such as: What electronic commerce protocols try to achieve? What they must achieve? and how they achieve it? My thesis in this dissertation is that: 1) In electronic commerce transactions where participants have different interests to preserve, protection of individual interests is a concern of the participants, and should be guaranteed by the protocols; and 2) A protocol should protect a participant's interests whenever the participant behaves according to the protocol and trusted parties behave as trusted. In this dissertation, we propose a formal definition of protection of individual interests and a framework in which protocols can be analyzed with respect to this property. Our definition is abstract and general, and can be instantiated to a wide range of electronic commerce protocols. In our framework, we model electronic commerce systems as state machines, make trust assumptions part of protocol specifications, and distinguish executions by deviation modes. We specify and analyze three protocols using this framework. Our analysis uses standard mathematical techniques. We found protocol weaknesses that have not been found before.

DTIC

Electronic Commerce; On-Line Systems; Computer Information Security; Data Processing

20010020037 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA

Survivability Analysis of Networked Systems

Jha, S.; Wing, J.; Oct. 2000; 23p; In English; Sponsored in part by Grant NSF-CCR95-23972.

Contract(s)/Grant(s): F33615-93-1-1330; F30602-97-2-0031

Report No.(s): AD-A384881; CMU-CS-00-168; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Survivability is the ability of a system to continue operating despite the presence of abnormal events such as failures and intrusions. Ensuring system survivability has increased in importance as critical infrastructures have become heavily dependent on computers. In this paper we present a systematic method for performing survivability analysis of networked systems. An architect injects failure and intrusion events into a system model and then visualizes the effects of the injected events in the form of scenario graphs. Our method enables further global analyses, such as reliability, latency, and cost-benefit analyses, where mathematical techniques used in different domains are combined in a systematic manner. We illustrate our ideas on an abstract model of the USA Payment System.

DTIC

Computer Networks; Markov Processes; Systems Analysis; Fault Tolerance

20010020053 Federal Highway Administration, Washington, DC USA

Value of Information and Information Services. How Decision Makers Value Information

1999; 32p; In English

Report No.(s): PB2001-102247; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Accurate, timely, and relevant information saves transportation agencies both time and money through increased efficiency, improved productivity, and rapid deployment of innovations. For example, access to research results allows agencies to benefit from the experiences of others and avoids costly duplication of effort. While the benefits are substantial, they are difficult to quantify and the value of information goes unrecognized. An extensive literature reviews with State DOT's, private companies, and

transportation libraries reveal that access to information yields both time and cost savings by improving decision making, expediting solutions, and avoiding unnecessary research. The benefits of information and information services are summarized.
NTIS
Information Systems; Decision Making; Information Dissemination; Transportation

20010021543 IBM Slovenia, Ljubljana, Slovenia
An Introduction to the PNNI Protocol ***Predstavitev PNNI Protokola***
Verlic, Robert, IBM Slovenia, Slovenia; Ozimek, Igor, Stefan (J.) Inst., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 233-237; In Slovene; Copyright; Avail: Issuing Activity

PNNI (Private Network-to-Network Interface) is a protocol used between private ATM switches or groups of private ATM switches. Its purpose is to support effective signalling and routing. Since there are different demands from various applications, e. g. bandwidth reservation and limited delay, PNNI was developed to meet these needs. PNNI dynamically updates switches with information about additions and changes of the network topology. It simplifies the configuration of' the network because it permits switches to learn about adjacent nodes and to distribute the information about the topology through the network. to keep the Structure simple, PNNI permits switches to be arranged in hierarchy. A subset of' switches that belong to the same level is called a Peer Group. There can be several such groups at the same level. The lowest level in hierarchy represents the physical network. All higher levels are logical levels consisting of logical group nodes. It is important to note that PNNI features are not intended to solve problems specific to ATM only, but also those arising from various applications. These demands must be taken into consideration not just in private but also in public networks like Internet.
Author
Internets; Protocol (Computers); Switches

20010021658 Air Force Studies and Analyses Agency, Force Analysis Div., Washington, DC USA
Tactical Data Link Gateways Introduction
Wallshein, Corinne; Dec. 22, 1999; 20p; In English
Report No.(s): AD-A385181; AFSAA-31494; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

At the February 1999 Air Force Board meeting, AC2ISRC briefed a Tactical Data Link (TDL) roadmap that used gateways between current and future TDLs. Approval of the roadmap was deferred, pending more information, which is supplied in this TDL Gateway Introduction requested by AF/XPPI. Gateways provide a conduit for data and information sharing, enabling battle space visualization. Prior to gateway implementation, it is vital to understand the information exchange requirements, their context, the systems providing data and information, the mission's intended information use, and the TDL environment. Recent Advanced Concept Technology Demonstrations (ACTDs) have shown quantified value-added by sharing specific Army ground data between Variable Message Format data link participants and Link 16 participants via tailored gateways. The Expeditionary Force Experiment (EFX) series in FY98 and FY99 showcased various TDL gateway demonstrations to share information among intelligence gathering platforms and operational platforms to improve mission performance. All stakeholders in the data link architecture, from the engineers who implement the data link system to the operators using them, need to understand the impact of the gateway on the architecture. With careful planning, using detailed network knowledge, and an effective training program, gateways can bridge separate TDLs. By designing and installing appropriate, dynamic filters, TDL gateways enable warfighters to access information rapidly, completely, and accurately; information that would otherwise have to be communicated over voice channels. TDL gateways are expected to improve mission performance. Quantfying expected improvements requires data collection, study, and dissemination.
DTIC
Data Links; Ground Tests; Messages; Communication

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also 54 Man/System Technology and Life Support.

20010020047 Pittsburgh Univ., Dept. of Computer Science, Pittsburgh, PA USA
Search Control for Automatic Plan Generation ***Final Report, 1 Aug. 1996-31 Jan. 1998***
Pollack, Martha; Jan. 1998; 10p; In English
Contract(s)/Grant(s): F49620-96-1-0403
Report No.(s): AD-A384859; AFRL-SR-BL-TR-00-0635; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this project, we analyzed the effectiveness of alternative search control strategies for automatic plan generation. We completed a detailed empirical study of control strategies for partial-order causal-link planners, identifying the relevant advantages and disadvantages of both strategies in the literative and novel strategies. We also developed search control heuristics for conditional planning, and demonstrated their effectiveness. Finally, we developed techniques for generating monitors during planning, without incurring excessive overhead.
DTIC
Heuristic Methods; Control Theory

20010020424 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA
Experimental and Theoretical Techniques for Nonlinear Identification and Adaptive Cancellation ***Final Report, 1 Oct. 1997-30 Sep. 2000***
Bernstein, Dennis S.; Dec. 05, 2000; 31p; In English
Contract(s)/Grant(s): F49620-98-1-0037
Report No.(s): AD-A385627; AFRL-SR-BL-TR-01-0006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Under this project we developed and demonstrated new techniques for identification and adaptive control. For linear identification, we developed quadratically constrained least squares (QCLS) identification, which extends classical least squares identification and is more resistant to the effects of system noise. For nonlinear identification, we developed a sequential method for combined Hammerstein-nonlinear feedback models. This method uses a piecewise linear approximation to the system nonlinearity and is based on computationally efficient numerical procedures. For adaptive control, we developed controllers for adaptive disturbance rejection and adaptive stabilization. These methods were implemented on laboratory experiments involving active noise control and rotating imbalance stabilization.
DTIC
Adaptive Control; Cancellation; Nonlinear Feedback

20010020443 George Mason Univ., Dept. of Computer Science, Fairfax, VA USA
Constructing and Refining Knowledge Bases: A Collaborative Apprenticeship Multistrategy Learning Approach ***Final Report, 1 Apr. 1997-31 May 2000***
Tecuci, Gheorghe; Aug. 30, 2000; 16p; In English
Contract(s)/Grant(s): F49620-97-1-0188
Report No.(s): AD-A385566; AFRL-SR-BL-TR-00-0679; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research has developed a theory, methodology and learning agent shell for development of knowledge bases and knowledge-based agents, by domain experts, with limited assistance from knowledge engineers. The main feature of this approach is that a subject matter expert communicates his or her expertise to the learning agent in a very natural way, similar to how the expert would communicate it to a human apprentice while solving problems in cooperation. Starting from an initial ontology, an expert may teach the agent how to solve a certain type of problem by providing a concrete example, helping the agent to understand the solution, supervising the agent as it attempts to solve new problems, and correcting its mistakes. Through such natural interactions, the agent will be guided in learning complex problem solving rules, and in extending and correcting its knowledge base. This research has been done in the context of the DARPA High Performance Knowledge Bases program, where it has been applied to two challenge problems, the Workaround challenge problem, and the Course of Action challenge problem. The agent development approach and the two developed agents have been evaluated in several intensive studies, and have demonstrated very good results.
DTIC
Knowledge Based Systems; Machine Learning

20010020478 Boeing Reusable Space Station, Riverside, CA USA

Autonomous Behavior via Multi Parallax Biomimetic Vision Systems

McCullough, E. D., Boeing Reusable Space Station, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 216; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Autonomous behavior based on the simultaneous correlation of multiple visual perspectives with stored data can be used to improve rover performance in difficult terrain on Mars, control terminal phases behavior of a planetary descent vehicle, and enable autonomous proximity operations near satellites and the Space Station. The stored data is obtained via a training process conducted in rugged and hazardous terrain on earth to establish a baseline of geometric situations and imperatives/constraints which bound the vehicles behavioral options on Mars. This approach would also provide the geometric situational awareness required for a biomimetic vehicle for scaling Martian cliffs. This technology updates Scene Mapping Area Correlator (SMAC) and Digital Scene Mapping Area Correlator (Digi-SMAC) technologies with current terabyte memory, photonics, fast processor technology, and the vision system of an arachnid. The autonomous behavior is an emergent property of rapid correlation of geometric constraints. In this approach, multiple images from different viewpoints are tiled into a composite image (for example a 2x4 array) and correlated with a set of stored tiled images in order to find the closest match. All the input images are correlated simultaneously and a match means that the current geometry around the viewpoints matches the geometry of the selected stored image to a greater degree than any of the others. The use of multiple images increases the number of parallaxes from 1 (humans) to 28 (arachnids). Simultaneous correlation makes the information contained in the additional parallaxes available for guiding vehicle behavior. The correlation is simplified as much as possible to reduce processing loads and is biased to account for time of day, azimuth orientation and sun angle. Additional biases take into account vehicle velocity.

Author

Mars Exploration; Mars Missions; Biomimetics; Image Processing; View Effects; Automation

20010020482 MD Space and Advanced Robotics Ltd., Strategic Development, Brampton, Ontario Canada

Robotic Arms: A Critical Element of any Mars Landed Mission

Middleton, J. A., MD Space and Advanced Robotics Ltd., Canada; Sallaberger, C. S., MD Space and Advanced Robotics Ltd., Canada; Reedman, T. J., MD Space and Advanced Robotics Ltd., Canada; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 223-224; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Landed exploration of Mars requires robust robotic systems capable of satisfying the demands of multiple scientific users. Whether the landed system is a stationary lander or a mobile rover, a robotic arm is an essential element of an exploration system that satisfies scientific needs while providing a method of dealing with unexpected contingencies. The basic purpose of any landed system is to explore and examine the surface and sub-surface of the planet in question, perhaps in conjunction with technology demonstration elements. to this end the basic needs for exploration are the deployment and retrieval of experiments to and from the surface, the acquisition of surface and sub-surface samples for analysis, and the imaging of the local environment. A robotic arm satisfies these requirements in a resource efficient manner and also adds an element of robustness to the system.

Author

Mars Missions; Robot Arms; Mission Planning; Mars Exploration

20010020507 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Safe Landings in Extreme Terrain

Rivellini, Tom, Jet Propulsion Lab., California Inst. of Tech., USA; Ortiz, Gary, Jet Propulsion Lab., California Inst. of Tech., USA; Steltzner, Adam, Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 269-270; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Following the failure of the Mars Polar Lander and the re-evaluation of the Mars Sample Return mission status, a Safe Landing Tiger team was established on January 7, 2000. The charter of the team was to re-evaluate large scale (1000-2000 Kg) Mars lander designs with the principal objective being the assurance of safe landing in hazardous terrain. The tiger team developed a number of concepts, two of the most notable and promising concepts, are both based on a Mobile Lander paradigm. Unlike the Pathfinder and Surveyor class landers, this paradigm groups all of the landed equipment into one of two categories: (1) EDL only equipment (i.e., not used after touchdown) and (2) multi-use equipment, those used during and or after touchdown. The objective is to maximize the use of all equipment being brought to the surface by placing the bulk of the avionics and mechanical systems onto a much larger 'rover' and leaving only the bare essentials on a 'dead-on-arrival' landing system. All of the hardware that the surface roving mission needs is enlisted into performing the EDL tasks. Any EDL specific avionics not used after touchdown are placed on the landing system.

Author

Mars Sample Return Missions; Mission Planning; Spacecraft Instruments; Mars Landing; Landing Instruments

20010020508 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Mars Mobile Lander Systems for 2005 and 2007 Launch Opportunities

Sabahi, D., Jet Propulsion Lab., California Inst. of Tech., USA; Graf, J. E., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, pp. 271-272; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

A series of Mars missions are proposed for the August 2005 launch opportunity on a medium class Evolved Expendable Launch Vehicle (EELV) with a injected mass capability of 2600 to 2750 kg. Known as the Ranger class, the primary objective of these Mars mission concepts are: (1) Deliver a mobile platform to Mars surface with large payload capability of 150 to 450 kg (depending on launch opportunity of 2005 or 2007); (2) Develop a robust, safe, and reliable workhorse entry, descent, and landing (EDL) capability for landed mass exceeding 750 kg; (3) Provide feed forward capability for the 2007 opportunity and beyond; and (4) Provide an option for a long life telecom relay orbiter. A number of future Mars mission concepts desire landers with large payload capability. Among these concepts are Mars sample return (MSR) which requires 300 to 450 kg landed payload capability to accommodate sampling, sample transfer equipment and a Mars ascent vehicle (MAV). In addition to MSR, large in situ payloads of 150 kg provide a significant step up from the Mars Pathfinder (MPF) and Mars Polar Lander (MPL) class payloads of 20 to 30 kg. This capability enables numerous and physically large science instruments as well as human exploration development payloads. The payload may consist of drills, scoops, rock corers, imagers, spectrometers, and in situ propellant production experiment, and dust and environmental monitoring.

Author

Mars Sample Return Missions; Mars Missions; Payloads; Mission Planning; Equipment Specifications; Mars (Planet)

20010020520 NASA Ames Research Center, Moffett Field, CA USA

Field Experiments with Planetary Surface Rovers: Lessons for Mars Mission Architecture

Stoker, Carol, NASA Ames Research Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 292-293; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Over the last decade, a variety of field experiments have been performed that simulate operations of a rover on Mars. These, in combination with the Pathfinder experience, lead to a realistic assessment of rover mission capabilities and to recommendations for rover technology and mission architecture to improve the science return of Mars exploration. A table summarizes field experiments that represent a range of possible mission designs and operational strategies. The experiments varied by the type and quality of imaging systems and other instrumentation, the use of orbital and aerial imaging and spectroscopy, the communcation bandwidth and command strategy, and the distance traveled. All mission simulations were blind field tests operated by science teams whose interpretations were compared to field ground truth providing an assessment of the accuracy of remote science interpretations and a better understanding of where improvements are needed.

Author

Mars Missions; Mars Exploration; Mission Planning; Roving Vehicles; Simulation

20010020531 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Nanorovers and Subsurface Explorers for Mars

Wilcox, Brian H., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 314-315; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Recent advances in microtechnology and mobile robotics have made it feasible to create extremely small automated or remote-controlled vehicles which open new application frontiers. One of these possible applications is the use of nanorovers (robotic vehicles with a mass of order one kilogram or less) in planetary exploration. NASA and Japan's Institute of Space and Astronautical Science (ISAS) are cooperating on the first mission to collect samples from the surface of an asteroid and return them to Earth for in-depth study. The ISAS MUSES-C mission will be launched on a Japanese launch vehicle in July 2002 from Japan toward a rendez-vous with the asteroid 1989ML in September 2003. A NASA-provided nanorover will conduct in-situ measurements on the surface. With a mass of about one kilogram, the rover experiment will be a direct descendant of the technology used to build the Sojourner rover. The rover will carry three science instruments: (1) a visible imaging camera, (2) a near-infrared point spectrometer, and (3) an alpha X ray spectrometer. The solar-powered rover will move around the surface of 1989ML collecting imagery data, which are complimentary to the spacecraft investigation. The imaging system will be capable of making surface texture, composition, and morphology measurements at resolutions better than one millimeter. The rover will transmit this data to the spacecraft for relay back to Earth. Due to the microgravity environment on 1989ML, the rover has been designed to right itself in case it flips over. Solar panels on four sides of the rover will ensure that enough power will always be available

to the rover to activate the motors needed to turn over. Posable struts will allow the rover to position its chassis such that the camera can be pointed straight down at the surface or straight up at the sky.
Author
Spectrometers; Asteroids; Samples; Composition (Property); Spacecraft Instruments

20010020844 Rutgers - The State Univ., Dept. of Mathematics, Piscataway, NJ USA
Control of Nonlinear Systems ***Final Report, 1 Jan. 1995 - 31 Dec. 1997***
Sontag, Eduardo D., Rutgers - The State Univ., USA; January 1998; 19p; In English
Contract(s)/Grant(s): F49620-95-1-0101; AF Proj. 2304
Report No.(s): AD-A385049; AFRL-SR-BL-TR-00-0646; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
This Final Report summarizes accomplishments of the grant research, which dealt with several topics related to the control of nonlinear systems, including input to state stability and new related notions (such as input/output to state stability), discontinuous feedback techniques based on nonsmooth analysis, universal inputs, with applications to numerical methods, and control-Lyapunov functions.
Author
Nonlinear Systems; Stability; Feedback

20010020879 Pittsburgh Univ., Dept. of Information Science, Pittsburgh, PA USA
Systems Based on Bayesian Belief Networks and Structural Equation Models for Command and Control Support ***Final Report, 1 Apr. 1997 - 31 Dec. 1999***
Druzdzel, Marek J.; Jul. 20, 2000; 20p; In English
Contract(s)/Grant(s): F49620-97-1-0225
Report No.(s): AD-A385765; AFRL-SR-BL-TR-01-0003; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The performed project focused on a new paradigm of planning systems that are based on a combination of Bayesian networks and structural equation models. We focused on theoretical issues that surround combining the two in a practical planning system, developing the foundations for, and building a prototype of such system. The approach and the system built allow for efficient, yet normatively correct, treatment of various types of information, uncertainty, and utility. It is especially powerful in complex situations where the available information is heterogeneous and consists of a mixture of deterministic and uncertain relationships among discrete and continuous variables. Our main contributions are: (1) several fast state of the art stochastic sampling algorithms for approximate inference in graphical models, (2) treatment of reversible causal mechanisms for causal reasoning in graphical models, (3) a scheme for interactive construction of causal graphical models based on causal mechanisms, (4) an algorithm for learning graphical models from data, and (5) a prototype of the system, used by over 2,300 people world-wide.
DTIC
Bayes Theorem; Mathematical Models; Decision Making; Command and Control; Algorithms

20010020880 California State Univ., Dept. of Mathematics, Los Angeles, CA USA
Wavelets and Neural Networks ***Final Report, 1 Apr. 1997 - 31 Dec. 1999***
Mhaskar, H. N.; Dec. 1999; 7p; In English
Contract(s)/Grant(s): F49620-97-1-0211
Report No.(s): AD-A385766; AFRL-SR-BL-TR-01-0004; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
During our previous work, we had established a very dose connection between polynomial approximation and approximation by neural networks. In fact, we had developed a unified theory of the approximation properties of neural networks, radial basis function (RBF) networks, and generalized regularization networks. Our networks provided an optimal approximation to a class of functions, where the only known a priori assumption was the number of continuous derivatives. The networks did not require all training in the classical sense, but were given explicitly in terms of the coefficients of the target function in certain orthogonal expansions. Our current objectives are the following. Modify the formulas for the networks, so that the networks can be obtained in terms of the values of the target function at judiciously chosen points. Develop polynomial wavelets with an eventual objective of integrating these with the theory of 'generalized translation networks' which we had previously developed.
DTIC
Neural Nets; Wavelet Analysis; Polynomials; Approximation

20010021210 Naval Research Lab., Marine Geosciences Div., Stennis Space Center, MS USA

Control/Learning Architectures for Use in Robots Operating in Unstructured Environments

McDowell, Patrick; Iyengar, S. S.; Gendron, Marlin; Bourgeois, Brian; Sample, John; Oct. 19, 2000; 13p; In English; Pub. in Proceedings of the Southern Conference on Computing, University of Southern Mississippi, Hattiesburg, MS, 26-28 October 2000. Prepared in cooperation with Louisiana State Univ., Dept. of Computer Science, Baton Rouge, LA.

Report No.(s): AD-A385438; NRL/PP/7440--00-1008; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The LSU Robo-Tiger project is a joint effort involving LSU's Computer Science, Electrical Engineering, and Athletic departments. The idea was conceived by Dr. S. S. Iyengar and Dr. Lynn Jelinski late in the fall semester of 1999. The goal was to build a cybernetic tiger to be used to help the school mascot, Mike the Tiger, with his duties at the schools various athletic functions. In doing so, it was hoped the project would not only catch the imagination of the students and faculty, but also provide a viable research platform for studying various issues pertaining to mobile robots in unstructured environments. Under the direction of Dr. S. S. Iyengar, the LSU Computer Science department's Robot Research Lab has conducted preliminary studies to determine the feasibility of the project. The first phase of the project consisted of constructing, modifying and programming a small prototype of the tiger. A series of three prototypes were used to identify the various issues involved in developing a full sized robotic tiger. Although the resulting prototypes are much simplified versions of the final product, many of the ideas, concepts, algorithms and construction methods are applicable.

DTIC

Robots; Cybernetics; Systems Engineering; Machine Learning; Adaptive Control

20010021292 Helsinki Univ. of Technology, Lab. of Process Control and Automation, Espoo, Finland

Helsinki University of Technology, Laboratory of Process Control and Automation Triennial Activity Report, *1997-1999*

Jamsa-Jounela, S.-L., Helsinki Univ. of Technology, Finland; Viherlaakso, M.-L., Helsinki Univ. of Technology, Finland; Vapaavuori, E., Helsinki Univ. of Technology, Finland; Kampe, J., Helsinki Univ. of Technology, Finland; 1999; ISSN 1455-4046; 60p; In English

Report No.(s): PB2000-105626; ISBN 951-22-4786-0; Copyright; Avail: National Technical Information Service (NTIS)

This report describes briefly the staff, facilities and research activities of the laboratory of Process Control and Automation during the years 1997-1999.

NTIS

Process Control (Industry); Universities; Automation; Technology Utilization

20010021352 Osaka City Univ., Faculty of Engineering, Japan

PPL Based on Trigonometric Smoothing Functions as Activation Functions of Hidden Units

Wada, Koli, Osaka City Univ., Japan; Hirai, Makoto, Osaka City Univ., Japan; Nakajima, Shigeyoshi, Osaka City Univ., Japan; Okamoto, Jiro, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 93-99; In English; Copyright; Avail: Issuing Activity

Recently Projection Pursuit Learning (PPL) emerged in the Neural Network (NN) literatures in recent years which used smoothing functions as activation functions in hidden units of NN. As this network uses smoothing functions as activation functions for hidden units, adaptability for various problems is expected to be excellent than other networks. In this paper we proposed a Tri-PPL network which used trigonometric functions as smoothing functions in the hidden units. Comparing Tri-PPL method with BPL (Back Propagation Learning) method through parity discrimination problems, the former is proved to be superior than the latter on the points of the learning speed and the number of total parameters needed to make optimum learning.

Author

Smoothing; Trigonometric Functions

20010021603 NASA Marshall Space Flight Center, Huntsville, AL USA

Video-Based Sensor for Robotic Position and Attitude determination

Howard, Richard T., NASA Marshall Space Flight Center, USA; Bryan, Thomas C., NASA Marshall Space Flight Center, USA; Book, Michael L., NASA Marshall Space Flight Center, USA; [2001]; 2p; In English; 6th; Artificial Intelligence, Robotics, and Automation in Space, 18-22 Jun. 2001, Montreal, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

NASA's Marshall Space Flight Center (MSFC) has, for the last ten years, developed various video-based sensors for use in automated docking systems. The latest generation of sensor will operate at rates of up to 100 Hz, determining the relative position (X, Y, and Z) and attitude (Roll, Pitch, and Yaw) between the sensor and a small 3-dimensional target, making it suitable for applications in robotic sensing. The Advanced Video Guidance Sensor (AVGS) is designed to track multiple targets at different ranges and determine the position and attitude of each one. The previous generation of video sensor, the Video Guidance Sensor

(VGS), was flown twice on the Space Shuttle to test its performance on orbit. One of the tests performed was determining the relative positions and attitudes between the VGS and its target, which was moved to various positions using the Remote Manipulator System (RMS). The RMS position data and VGS measured data were analyzed after the flights, with good correlation between the position and attitude data of the two data sets. The test using the RMS gives a good idea of the ability of the use of the AVGS as a sensor for end-effector position and attitude determination.
Author
Attitude (Inclination); Robotics; Video Equipment; Guidance Sensors; Position (Location)

64
NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20010020808 National Inst. of Standards and Technology, Gaithersburg, MD USA
Phase-Field Model with Convection: Sharp-Interface Asymptotics
Anderson, D. M., George Mason Univ., USA; McFadden, G. B., National Inst. of Standards and Technology, USA; Wheeler, A. A., Southampton Univ., UK; Oct. 25, 2000; 44p; In English
Report No.(s): PB2001-100011; NISTIR-6568; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We have previously developed a phase-field model of solidification that includes convection in the melt. This model represents the two phases as viscous liquids, where the putative solid phase has a viscosity much larger than the liquid phase. The object of this paper is to examine in detail a simplified version of the governing equations for this phase-field model in the sharp-interface limit and derive the interfacial conditions of the associated free-boundary problem. The importance of this analysis is that it reveals the underlying physical mechanisms built into the phase-field model in the context of a free-boundary problem and, in turn, provides a further validation of the model. In equilibrium we recover the standard interfacial conditions including the Young-Laplace and Clausius-Clapeyron equations that relate the temperature to the pressures in the two bulk phases, the interface curvature and material parameters. In nonequilibrium we identify boundary conditions associated with classical hydrodynamics, such as the normal mass flux conditions, the no-slip condition and stress balances. We also identify the heat flux balance conditions which is modified to account for the flow, interface curvature, and density difference between the bulk phases. The interface temperature satisfies a nonequilibrium version of the Clausius-Clapeyron relation which includes the effects of curvature, attachment kinetics, and viscous dissipation.
Author
Convection; Solidification; Interfaces; Curvature; Free Boundaries

20010021257 Helsinki Univ. of Technology, Inst. of Mathematics Research Reports, Espoo, Finland
On the Numerical Solution of Involutive Ordinary Differential Systems: Higher Order Methods 2
Tuomela, Jukka, Helsinki Univ. of Technology, Finland; Arponen, Teijo, Helsinki Univ. of Technology, Finland; 1999; ISSN 0784-3143; 20p; In English
Report No.(s): PB2000-102624; ISBN 951-22-4352-0; No Copyright; Avail: National Technical Information Service (NTIS)

We discuss numerical results obtained when computing one-dimensional integral manifolds with Ringe-Kutta type method.
Author
Manifolds (Mathematics); Differential Equations

20010021377 Maryland Univ., College Park, MD USA
Computation and Visualization in Nonlinear Mechanics ***Final Report, 1 Jun 1995-31 May 1998***
Maddocks, John; May 31, 1998; 2p; In English
Contract(s)/Grant(s): F49620-95-1-0379
Report No.(s): AD-A385547; AFRL-SR-BL-TR-00-0809; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This award supported the University of Maryland Ph.D studies of Randy C. Paffenroth. He completed his thesis in January 1999, and is now a postdoc at the Center for Research in Parallel computing, California Institute of Technology. The thesis title was Mathematical, Visualization, Parameter Continuation, and Steered Computations. Finally the software VBM the development of which formed a major part of the Ph.D work of Paffenroth was the subject of a talk at the International Congress of Mathematicians in Berlin, 1998, in the Special Session on Mathematical Software.
DTIC
Object-Oriented Programming; Boundary Value Problems; Mechanics (Physics); Nonlinear Systems; Software Engineering; Research

65
STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

20010020442 Cornell Univ., Dept. of Computer Science, Ithaca, NY USA
Updating Beliefs in Incompletely Specified Situations ***Final Report, 1 Jul. 1996 - 31 Dec. 1997***
Halpern, Joseph Y.; Dec. 1997; 6p; In English
Contract(s)/Grant(s): F49620-96-1-0323
Report No.(s): AD-A385567; AFRL-SR-BL-TR-01-0002; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This project focused on a number of issues related to updating beliefs, both qualitative and quantitative, in incompletely specified settings. In addition, work was initiated on the topic of explanation.
DTIC
Knowledge Based Systems; Computerized Simulation

20010021028
Basic distribution free identification tests for small size samples of environmental data
Federico, A. G.; Musmeci, F.; Jan. 31, 1998; 19p; In English
Report No.(s): DE99-712662; ENEA-RT-AMB-97-29; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Testing two or more data sets for the hypothesis that they are sampled form the same population is often required in environmental data analysis. Typically the available samples have a small number of data and often then assumption of normal distributions is not realistic. On the other hand the diffusion of the days powerful Personal Computers opens new possible opportunities based on a massive use of the CPU resources. The paper reviews the problem introducing the feasibility of two non parametric approaches based on intrinsic equi probability properties of the data samples. The first one is based on a full re sampling while the second is based on a bootstrap approach. A easy to use program is presented. A case study is given based on the Chernobyl children contamination data.
NTIS
Statistical Analysis; Probability Theory; Sampling

20010021382 Hampton Univ., Dept. of Mathematics, VA USA
A Study of Non-Stationary Processes with Their Applications ***Final Report, 1 Sep. 1996 - 31 Aug. 2000***
Miamee, A. G.; Nov. 30, 2000; 38p; In English
Contract(s)/Grant(s): DAAH04-96-1-0027
Report No.(s): AD-A385795; ARO-33656.5-MA-SAH; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Stationary stochastic processes have been very useful in analyzing time series appear in applications. However in many engineering application and economic studies there are number of important time series that are not stationary. Hence several authors have been studied non-stationary processes. Several classes of non-stationary processes such as: (1) Harmonizable processes; (2) Periodically Correlated (PC) processes; (3) Almost Periodically Correlated (PAC) processes; and (4) Correlation Autoregressive (CAR) processes have been introduced and studied. In this project we have studying the non-stationary processes in general and the PC, APC, and CAR processes in particular obtaining several results which either have been published or submitted for publication in refereed journals.
DTIC
Stochastic Processes; Systems Engineering; Time Series Analysis; Autoregressive Processes

67
THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

20010020637
Approximate factorization procedure for solving nine-point elliptic difference equations. Application for a fast 2-D relativistic Fokker-Planck solver
Peysson, Y.; Choucri, M.; Sep. 30, 1997; 53p; In English
Report No.(s): DE99-609073; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A full implicit numerical procedure based on the use of a nine-point difference operator is presented to solve the two dimensional (2(sub D)) relativistic Fokker-Planck equation for the current drive problem and synergetic effects between the lower hybrid and the electron cyclotron waves in tokamaks. The convergence rate towards the steady state solution may be significantly enhanced with no loss of accuracy on the distribution function. Moreover, it is shown that the numerical stability may be strongly improved without a large degradation of the CPU time consumption as in the five-point scheme, making this approach very attractive for a fast solution of the 2-D Fokker-Planck equation on a fine grid in conjunction with other numerical codes for realistic plasma simulations. This new algorithm, based on an approximate matrix factorization technique, may be applied to all numerical problems with large sets of equations which involve nine-point difference operators.
NTIS
Factorization; Elliptic Differential Equations

20010020768
Star products and quantum superalgebras
Mansour, M.; Aug. 31, 1998; 14p; In English
Report No.(s): DE99-607927; IC-98/124; No Copyright; Avail: Department of Energy Information Bridge

I show that the star product on a Poisson Lie supergroup leads to the structure of quantum superalgebra (triangular Hopf superalgebra) on the super quantized enveloping algebra of the Lie superalgebra of the Lie supergroup.
NTIS
Lie Groups; Mathematics

20010020963
Generalized oscillator: invariance algebra and interbasis expansions
Hakopyan, E. M.; Pogosyan, G. S.; Sisakyan, A. N.; Kibler, M.; Dec. 31, 1998; 12p; In English
Report No.(s): DE99-602104; JINR-E-2-97-379; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This article deals with a quantum-mechanical system which generalizes the ordinary isotropic harmonic oscillator system. We give the coefficients connecting the polar and Cartesian bases for D=2 and the coefficients connecting the Cartesian and cylindrical bases as well as the cylindrical and spherical bases for D=3. These interbasis expansion coefficients are found to be analytic continuations to real values of their arguments of the Clebsch-Gordan coefficients for the group SU(2). For D=2, the super integrable character for the generalized oscillator system is investigated from the point of view of a quadratic invariance algebra.
NTIS
Harmonic Oscillators; Mechanical Oscillators

20010021349 Osaka City Univ., Faculty of Engineering, Japan
On the Estimate of Some Conjugation
Tarama, Shigeo, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 117-123; In English; Copyright; Avail: Issuing Activity

We draw the estimate for the conjugation of the operator exp(-delta/2 absolute value (D)(sup 2)) and a Gevrey function. This estimate that is known in the analytic case can be used to obtain a weighted Carleman estimate for some operators with partial Gevrey coefficient.
Author
Estimates; Conjugation

20010021350 Osaka City Univ., Faculty of Engineering, Japan

On the Lemma of Colombini, Jannelli and Spagnolo

Tarama, Shigeo, Osaka City Univ., Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 111-115; In English; Copyright; Avail: Issuing Activity

We show the absolute continuity of absolute value of (h(x))(sup 1/(kappa + alpha) and the related inequalities where a function h(x) belongs to C(sup kappa, alpha) (I) with a positive integer kappa and alpha an element of (0, 1]. Colombini, Jannelli and Spagnolo proved this property for non-negative functions. We see that their method works well for the general case.

Author

Theorems; Continuity; Continuity (Mathematics); Theorem Proving

70
PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see categories 71 through 77. For related instrumentation see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

20010019865 Institut Franco-Allemand de Recherches, Saint-Louis, France

European Forum on Ballistics of Projectiles (EFPB 2000)

Giraud, M., Editor, Institut Franco-Allemand de Recherches, France; Fleck, V., Editor, Institut Franco-Allemand de Recherches, France; [2000]; 226p; In English, 11-14 Apr. 2000, Saint-Louis, France

Contract(s)/Grant(s): F61775-00-W-F037

Report No.(s): AD-A385710; CSP-00-5037; No Copyright; Avail: CASI; A03, Microfiche; A11, Hardcopy

This is an interdisciplinary conference. Topics include: Defense Research Organization; Projectiles; Internal Ballistics/Propulsion; Launch Dynamics; Aeroballistics; Flight Dynamics; Terminal Ballistic Effects and Vulnerability; Sensors and Metrology; and Perspectives towards the 21st Century.

DTIC

Ballistics; Conferences; Projectiles; Europe

20010020771

Solution of BBGKY hierarchy of kinetic equations through the particle solution of Vlasov equation

Rasulova, M.; Siddiqi, A. H.; Aug. 31, 1998; 9p; In English

Report No.(s): DE99-606819; IC-98/118; No Copyright; Avail: Department of Energy Information Bridge

The solution of BBGKY hierarchy of kinetic equations is defined through particle method solution of Vlasov equation.

NTIS

Bbgky Hierarchy; Kinetic Equations

20010020911

Solution of Ising model on random lattices with large number of surface genus

Sahakyan, D.; Dec. 31, 1991; 12p; In English

Report No.(s): DE99-604278; YERPHI-1318-13-91; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Main singular terms at the expansion of two-matrix integral in powers of 1/ N(sup 2) are calculated up to the ninth order. The discontinuities of asymptotics (over the number of sites) of the statistical sum are obtained when the point of phase transition is passed.

NTIS

Ising Model; Crystal Lattices

20010020940 NASA Marshall Space Flight Center, Huntsville, AL USA

Inducing Lift on Spherical Particles by Traveling Magnetic Fields

Mazuruk, Konstantin, NASA Marshall Space Flight Center, USA; Grugel, Richard N., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 39th; Aerospace Science, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Gravity induced sedimentation of suspensions is a serious drawback to many materials and biotechnology processes, a factor that can, in principle, be overcome by utilizing an opposing Lorentz body force. In this work we demonstrate the utility of employing a traveling magnetic field (TMF) to induce a lifting force on particles dispersed in the fluid. Theoretically, a model has been developed to ascertain the net force, induced by TMF, acting on a spherical body as a function of the fluid medium's electrical conductivity and other parameters. Experimentally, the model is compared to optical observations of particle motion in the presence of TMF.
Author
Magnetic Fields; Lift; Particles

20010021332 Michigan Univ., Dept. of Mechanical Engineering and Applied Mechanics, Ann Arbor, MI USA
Numerical Modeling of Liquid-Vapor Phase Change ***Final Report, Aug. 1996 - Aug. 2000***
Esmaeeli, Asghar, Michigan Univ., USA; Arpaci, Vedat S., Michigan Univ., USA; Feb. 15, 2001; 7p; In English
Contract(s)/Grant(s): NAG3-1952
Report No.(s): DRDA-98-3449; C034943; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We implemented a two- and three-dimensional finite difference/front tracking technique to solve liquid-vapor phase change problems. The mathematical and the numerical features of the method were explained in great detail in our previous reports, Briefly, we used a single formula representation which incorporated jump conditions into the governing equations. The interfacial terms were distributed as singular terms using delta functions so that the governing equations would be the same as conventional conservation equations away from the interface and in the vicinity of the interface they would provide correct jump conditions. We used a fixed staggered grid to discretize these equations and an unstructured grid to explicitly track the front. While in two dimensions the front was simply a connection of small line segments, in three dimensions it was represented by a connection of small triangular elements. The equations were written in conservative forms and during the course of computations we used regriding to control the size of the elements of the unstructured grid. Moreover, we implemented a coalescence in two dimensions which allowed the merging of different fronts or two segments of the same front when they were sufficiently close. We used our code to study thermocapillary migration of bubbles, burst of bubbles at a free surface, buoyancy-driven interactions of bubbles, evaporation of drops, rapid evaporation of an interface, planar solidification of an undercooled melt, dendritic solidification, and a host of other problems cited in the reference.
Derived from text
Liquid-Vapor Interfaces; Liquid Phases; Algorithms; Finite Difference Theory; Three Dimensional Models; Mathematical Models

20010021522 Oak Ridge National Lab., TN USA
R-Matrix Evaluation of O-16 neutron cross sections up to 6.3 MeV
Sayer, R. O.; Leal, L. C.; Larson, N. M.; Spencer, R. R.; Wright, R. Q.; Aug. 01, 2000; 51p; In English
Report No.(s): DE00-763225; ORNL/TM-2000-212; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper the authors describe an evaluation of O-16 neutron cross sections in the resolved resonance region with the multilevel Reich-Moore R-matrix formalism. Resonance analyses were performed with the computer code SAMMY (LA98) which utilizes Bayes' method, a generalized least squares technique.
NTIS
Matrices (Mathematics); Oxygen Isotopes; Neutron Cross Sections

20010021613 Los Alamos National Lab., Univ. of California Directed Research and Development Program, NM USA
New Look at Time Dependent Transport of Magnetic Helicity
Moses, R. W.; 2000; 2p; In English
Report No.(s): PB2001-102491; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

This paper has two purposes. First, a new definition of magnetic helicity is presented to give a sharper distinction between inductive and parallel-electrostatic magnetic helicity transport. Second, a theorem is described which states that only parallel-electrostatic transport can indefinitely sustain magnetic helicity dissipation in a torus, where the boundary moves to maintain a constant volume averaged toroidal flux.
NTIS
Time Dependence; Magnetic Fields; Electrostatics; Cosmic Rays; Solar Wind

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ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see 45 Environment Pollution. For aircraft noise see also 02 Aerodynamics and 07 Aircraft Propulsion Propulsion and Power.

20010019892 Norwegian Defence Research Establishment, Kjeller, Norway
Identification of Resonance Structures in Echo Signals From Simple Cylindrical Objects
Sevaldsen, Erik, Norwegian Defence Research Establishment, Norway; Jan. 03, 2001; 30p; In English; Original contains color illustrations
Contract(s)/Grant(s): FFIBM Proj. 765/116
Report No.(s): FFI/RAPPORT-2000/01528; ISBN 82-464-0483-0; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This note presents results from analysis of data from a series of measurements where a set of cylinders have been insonified at relatively short range by a low frequency broadband sonar source. The purpose of the analysis was to identify resonance structures in reflected sonar signals, and to estimate cylinder properties like diameter, filling material, was thickness and wall material based on the resonance feature. The analysis software used has been developed at SACLANTCEN under projects aimed at improving classification of buried mines and mines in high clutter areas. Our objective with the testing was to gain experience with resonance structure analysis by making tests and collecting data in a similar way as has previously been done at SACLANTCEN, and analyzing the recorded echo signals using SACLANTCEN's software. The analysis software which also includes models of simple cylindrical objects, had been transferred to FFI early 1998 as part of a Joint Research Project (the JRP on Detection and Classification of Mines). The tests combined both air-filled and water-filled cylinders, and included tubes of diameters from 89 to 500 mm insonified at normal incidence and tilted at a small angle with the normal. Our results for the larger diameter cylinders are quite in line with what has been found at SACLANTCEN. Tilted incidence also produced results comparable to results obtained at normal incidence in several cases. Regarding analysis of small diameter tube data the software would not always provide results. This document has been prepared under project UNISON.
Author
Classifications; Detection; Identifying; Resonance; Resonant Frequencies; Sonar; Echo Sounding; Sound Ranging; Sound Fixing and Ranging; Echoes

20010019900 Norwegian Defence Research Establishment, Kjeller, Norway
Software Requirements Specification for an Extended Version of the Acoustic Model Lybin to be Used in Sonar Performance Evaluation
Sevaldsen, Erik, Norwegian Defence Research Establishment, Norway; Frode, Langset, Norwegian Defence Research Establishment, Norway; Hakon, Ljogodt, Norwegian Defence Research Establishment, Norway; Dec. 22, 2000; 26p; In English
Contract(s)/Grant(s): FFIBM Proj. 795/161.4
Report No.(s): FFI/RAPPORT-2000-06224; ISBN 82-464-0484-9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

FFI project 795 'New Frigates' Work Package 1 shall support NAVMATCOMNOR in testing and verification of frigate sonar performance. It has been decided that the acoustic model LYBIN shall be the basic tool for performance evaluation. LYBIN as of today is an operational sonar prediction model. This report specifies the modifications and extensions to the model which are required to make LYBIN into the performance evaluation tool needed.
Author
Acoustics; Evaluation; Performance Tests; Specifications; Sonar; Models

20010020875 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA
A Numerical Investigation of Sound Generation in Supersonic Jet Screech ***Final Report, 1 Apr. 1998-30 Sep. 2000***
Manning, Ted A.; Lele, Sanjiva K.; Nov. 30, 2000; 235p; In English
Contract(s)/Grant(s): F49620-98-1-0355
Report No.(s): AD-A385651; AFRL-SR-BL-TR-00-0671; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The noise of supersonic jet flows is due in part to the interaction between jet instability waves and the jet shock-cell structure. If no countermeasures are taken, the emitted shock-cell noise will re-excite certain instability wave modes at the nozzle lip and cause resonant feedback to occur. This feedback resonance, known as supersonic jet screech, causes the jet to flap violently at discrete frequencies and generate very strong, narrow banded tones. Jet screech has been shown to be a source of acoustic fatigue in the tail and nozzle structures of supersonic aircraft. It is important that methods for predicting the screech amplitude be developed. Screech sound generation is one such element. We isolate the interaction of an unsteady shear layer with a single oblique shock. to obtain an overall understanding of the phenomenon with fewest simplifications, we study this problem through the

numerical solution of the Navier Stokes equations. We then consider idealizations which allow us to obtain a similar but wider range of results with specially linearized Euler equations. The findings of these r0sults motivate the use of geometric acoustics to describe the screech generation process. The Navier-Stokes and Euler simulations have revealed important details about the interaction process, how the acoustic field results, and why screech is so loud. The mechanism for sound production is found to be fundamentally different and more efficient when the instability waves are the large vortices typical of screech, than when they are small disturbances. Geometrical acoustics can be used to explain the leakage effect at high instability wave amplitude. We conclude that the mechanism for high amplitude screech generation is an unsteady modification to the velocity field by the instability waves that permits the incident shock to refract through the shear layer.
DTIC
Aerodynamic Noise; Jet Aircraft Noise; Supersonic Aircraft; Supersonic Jet Flow; Flow Noise; Jet Flow; Acoustic Fatigue; Screech Tones; Sound Waves

20010020883 Department of the Navy, Washington, DC USA
Dual Bi-Laminate Polymer Audio Transducer
Corsaro, Robert D., Inventor; Jan. 2000; 37p; In English
Patent Info.: Filed 20 0. 20; US-Patent-Appl-SN-80,022
Report No.(s): AD-D019748; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche
Various embodiments of low-mass sound generators each having a wide frequency band are disclosed. In some embodiments, the acoustic transducer acting as the sound generator is constructed of four layers of PVDF film. The top and bottom bi-laminate members are separately formed in a pre-curved manner to form a rippled geometry.
DTIC
Electroacoustic Transducers; Sound Transducers; Sound Generators; Patent Applications

20010021387 Woods Hole Oceanographic Inst., MA USA
Low-Grazing-Angle Monostatic Acoustic Reverberation from Rough and Heterogeneous Seafloors
Greaves, Robert J., Woods Hole Oceanographic Inst., USA; Stephen, Ralph A., Woods Hole Oceanographic Inst., USA; Journal of the Acoustical Society; Sep. 2000; ISSN 0001-4966; Volume 108, No. 3, pp. 1013-1025; In English
Contract(s)/Grant(s): N00014-90-J-1493; N00014-95-1-0506
Report No.(s): AD-A384075; WHOI-CONTRIB-10186; Copyright; Avail: Defense Technical Information Center (DTIC)
Numerical wavefield modeling, based on time domain finite difference solutions to the full elastic wave equation, is used to quantitatively predict the sensitivity of monostatic backscatter to variations in geological properties of the seabed. This article addresses the hypothesis that observed backscatter signals from the seafloor are produced by combination of seafloor (interface) and subseafloor (volume) scattering from structures having variations at scale lengths comparable to the wavelength of the insonifying acoustic field. Wavelength-scale seafloor roughness and subseafloor volume heterogeneity parameters are defined using stochastic spatial probability functions having Gaussian autocorrelations. The range of the variation in these parameters is constrained to realistic values based on estimates derived from seafloor bathymetry and other geologic data. Modeling results show that backscattering from rough, basaltic (hard) bottoms, in the absence of large-scale seafloor slope, is dominated by rough surface scattering with little contribution from volume scattering. Contrary to this, sediment (soft) bottoms with subseafloor volume heterogeneity, with or without seafloor roughness, produce significant backscattering signals compared to a homogeneous sediment bottom.
DTIC
Grazing; Heterogeneity; Reverberation; Ocean Bottom; Sediments; Sea Roughness; Ocean Models

20010021418 Stanford Univ., Div. of Mechanics and Computation, Stanford, CA USA
Computation of Trailing Edge Noise From an Incompressible Flow Calculation
Wang, M., Stanford Univ., USA; Oberai, Assad A., Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 343-352; In English; See also 20010021392; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche
A new methodology for calculating low Mach number trailing edge noise is developed and tested. The input to this methodology is the fluctuating surface pressure obtained from an incompressible, turbulent flow calculation. The surface pressure is used to calculate an intermediate incident pressure. This pressure in conjunction with the sound-hard boundary condition yields the

scattered pressure which accounts for the effect of the rigid airfoil. Through numerical experiments it is found that the proposed methodology is sensitive to noise in the data. Modifications that circumvent this sensitivity are under consideration.
Author
Aeroacoustics; Aerodynamic Noise; Incompressible Flow; Pressure Distribution; Turbulent Flow

72
ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20010019831 Illinois Univ., Dept. of Physics, Chicago, IL USA
Studies of Dynamically Enhanced Electromagnetic Coupling in Self-Trapped Channel ***Final Report, 3 May 1997 - 4 May 2000***
Rhodes, Charles K.; Aug. 02, 2000; 4p; In English
Contract(s)/Grant(s): DAAG55-97-1-0310
Report No.(s): AD-A385109; ARO-36442.6-PH; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Detailed molecular structural information is of enormous significance to the medical and biological communities. Since hydrated biologically active structures are small delicate complex three-dimensional (3D) entities, it is essential to have molecular scale spatial resolution, high contrast, distortionless, direct 3D modalities of visualization of specimens in the living state in order to faithfully reveal their full molecular architectures. An x-ray holographic microscope equipped with an x-ray laser as the illuminator would be uniquely capable of providing these images. The findings presented in this report: (1) experimentally demonstrate at lambda 2.9 A the operation of a new concept capable of producing the ideal conditions for amplification of multikilovolt x-rays and (2) prove the feasibility of a compact x-ray illuminator that can cost-effectively achieve the mission of x-ray biological microholography and likewise serve an array of other applications involving the fabrication and measurement of solid state nanostructures. An estimate of the peak brightness achieved in these initial experiments gives a value of approx. 10(exp 29) gamma/sec/sq mm/sq mr/(0.1% Bandwidth), a magnitude that is approx. 10(exp 5)-fold higher than presently available synchrotron technology.
DTIC
Electromagnetic Coupling; Molecular Structure

20010020018 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA
Fourier transform photoelectron diffraction and its application to molecular orbitals and surface structure
Zhou, X.; Nov. 30, 1998; 123p; In English
Report No.(s): DE00-006458; LBNL--42589; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Photoemission intensities from the molecular orbitals of c(2x)CO/Pt(111) over a wide photon energy range were measured and analyzed by the same methods developed for structural studies using core levels. The delta orbital center of gravity is found to be concentrated between the C and O atoms, while that of the 5 delta orbital center of gravity is found to be concentrated between the C and O atoms, while that of the 5 delta orbital lies between the C atom and the Pt surface. The C 1s photoelectron diffraction was used to determine the adsorption geometry.
NTIS
Fourier Transformation; Photoelectrons; Diffraction

20010020151 NASA Marshall Space Flight Center, Huntsville, AL USA
Design and Preliminary Testing of a High Performance Antiproton Trap (HiPAT)
Martin, James, NASA Marshall Space Flight Center, USA; Meyer, Kirby, Pennsylvania State Univ., USA; Kramer, Kevin, Pennsylvania State Univ., USA; Smith, Gerald, Synergistic Technologies, Inc., USA; Lewis, Raymond, Lewis (R.) Co., USA; Oct. 2000; 8p; In English; Space Technology Applications International Forum, 10 -16 Feb. 2001, Albuquerque, NM, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Antimatter represents the pinnacle of energy density, offering the potential to enhance current fusion/fission concepts enabling various classes of deep space missions. Current production rates are sufficient to support proof-of-concept evaluation of many key technologies associated with antimatter-derived propulsion. Storage has been identified as a key enabling technology for all antimatter-related operations, and as such is the current focus of this NASA-MSFC effort to design and fabricate a portable device capable of holding up to 10(exp 12) particles. Hardware has been assembled and initial tests are underway to evaluate the trap behavior using electron gun generated, positive hydrogen ions. Ions have been stored for tens of minutes, limited by observed

interaction with background gas. Additionally, radio frequency manipulation is being tested to increase lifetime by stabilizing the stored particles, potentially reducing their interaction with background gas, easing requirements on ultimate trap vacuum and precision mechanical alignment.
Author
Positive Ions; Matter-Antimatter Propulsion; Ions; Antiprotons; Design Analysis; Performance Tests; Trapped Particles

20010020217 Universities Space Research Association, Huntsville, AL USA
Molecular Dynamic Simulations of Interaction of an AFM Probe with the Surface of an SCN Sample
Bune, Adris, Universities Space Research Association, USA; Kaukler, William, Alabama Univ., USA; [2001]; 1p; In English; Solidification Science and Processing, 18-21 Feb. 2001, Bangalore, India
Contract(s)/Grant(s): NCC8-66; No Copyright; Avail: Issuing Activity; Abstract Only

Molecular dynamic (MD) simulations is conducted in order to estimate forces of probe-substrate interaction in the Atomic Force Microscope (AFM). First a review of available molecular dynamic techniques is given. Implementation of MD simulation is based on an object-oriented code developed at the University of Delft. Modeling of the sample material - succinonitrile (SCN) - is based on the Lennard-Jones potentials. For the polystyrene probe an atomic interaction potential is used. Due to object-oriented structure of the code modification of an atomic interaction potential is straight forward. Calculation of melting temperature is used for validation of the code and of the interaction potentials. Various fitting parameters of the probe-substrate interaction potentials are considered, as potentials fitted to certain properties and temperature ranges may not be reliable for the others. This research provides theoretical foundation for an interpretation of actual measurements of an interaction forces using AFM.
Author
Atomic Force Microscopy; Molecular Dynamics; Computerized Simulation; Nitriles

20010020361 Arizona Univ., Dept. of Chemistry, Tucson, AZ USA
DURIP 99 - Instrumentation for Characterization of Two-Photon and Excited-State Properties of Conjugated Molecules
Final Report, 1 Mar. 1999-29 Feb. 2000
Perry, Joseph W.; May 31, 2000; 14p; In English
Contract(s)/Grant(s): F49620-99-1-0161; AF Proj. 3484
Report No.(s): AD-A385782; AFRL-SR-BL-TR-01-0017; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the status of the apparati which have been created or augmented by equipment purchased under the titled DURIP grant. Initial progress made using these systems in studies of two-photon absorption and optical limiting is also reported. Two new measurement systems have been set up and are operational. These systems are: (1) nanosecond transient absorption spectroscopy, and (2) femtosecond time resolved absorption spectroscopy. The transient spectroscopy systems provide a capability for monitoring the time evolution of transient species over the time scale of approximately equal 100 fs to milliseconds, by following absorption bands in the range of approximately equal 300 to 1000 nm. Initial results obtained using the new systems described above are presented. (1) The optical limiting properties of a new charge transfer complex (bis-(dibutylamino)stilbene:(2,4,7-trinit-9-ylidene)malononitrile; BDAS:TNFDM) are reported. This complex shows a sizeable nonlinear response at 600nm which is dependent on solvent polarity, with the strongest response in toluene solution. (2) the solvent dependence of the nonlinear transmission response of BDAS, which is dominated by two-photon induced excited state absorption (TPESA), is reported. Very large nonlinear absorption coefficients are observed in polar solvents like acetonitrile, alcohols and acetone, up to a factor of 10 larger than that in toluene. This indicates that optimization of the environment can be important for TPESA chromophores like BDAS.
DTIC
Photon Absorptiometry; Molecules; Excitation; Absorption Spectroscopy; Absorption Spectra; Photons; Conjugation

20010020631
Photoelectric effect in the relativistic domain revealed by the time-reversed process for highly charged uranium ions
Stoehlker, T.; Mokler, P. H.; Kozhuharov, C.; Warczak, A.; Oct. 31, 1996; 33p; In English
Report No.(s): DE99-712759; GSI-96-50(PREPR.); No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The photoelectric effect in the near relativistic energy regime of 80 to 350 keV is studied by the time-reversed process in ion-atom collisions, i.e. by the radiative capture of a quasi-free target electron. We review shell and subshell differential photon-angular distribution studies of radiative capture into highly-charged uranium ions. The experimental data are compared with exact relativistic calculations and give detailed insight into both the atomic structure of high-Z few-electron ions and into the fundamen-

tal electron-photon interaction process involved. In particular it is shown that the angular-differential measurements provide a unique method to study the magnetic interaction in relativistic electron-photon.
NTIS
Photoelectric Effect; Domains; Atomic Physics

20010020633
Collective excitations in nuclei
Chomaz, P.; Dec. 31, 1997; 79p; In English
Report No.(s): DE99-609077; GANIL-P-98-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The properties of the nucleus cannot be reduced to the properties of its constituents: it is a complex system. The fact that many properties of the nucleus are consequences of the existence of mean-field potential is a manifestation of this complexity. In particular the nucleons can thus self- organize in collective motions such as giant resonances. Therefore the study of these collective motions is a very good to understand the properties of the nucleus itself. The purpose of this article was to stress some aspects of these collective vibrations. In particular, we have studied how an ensemble of fermions as the nucleus can self-organize in collective vibrations which are behaving like a gas of bosons in weak interaction. In particular, the study of the states with one or two vibration quanta provides a direct information on the structure if nuclei close to their ground states.
NTIS
Excitation; Fermions; Nuclei (Nuclear Physics); Nuclear Physics

20010020646
Photon - axion conversions in a periodic electromagnetic field with axion frequency
Dang Van Soa,; Sep. 30, 1998; 7p; In English
Report No.(s): DE99-607930; IC-98/131; No Copyright; Avail: Department of Energy Information Bridge
The conversion of photons into axions in a periodic external electromagnetic field with axion frequency is considered in detail by Feynman methods. The differential cross sections are given. It is shown that there is a resonant conversion for the considered process.
NTIS
Photons; Frequency Converters

20010020716
Search and study of coherent fragmentation of carbon nucleus at 4,2 GeV/c per nucleon
Muminov, M. M.; Dec. 31, 1997; 77p; In Russian; In English
Report No.(s): DE98-621523; INIS-UZ-052; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A search for the reaction of coherent dissociation (sup 12)C (yields) 3(alpha) on carbon nuclei at 4,2 GeV/c per nucleon has been made. The cross section of this reaction and its dependence on mass number of nucleus were evaluated. The competitive analysis of the momentum and correlation characteristics of secondary alpha particles in the laboratory and center-of- mass frames of fragmenting nucleus with the incoherent events and with the same data for heavy targets was carried out. It was shown that the mechanism of (sup 12)C (yields) 3 (alpha) decay is essentially changing with target nucleus and depends on the type of nucleus-nucleus interaction. We have also measured the yield of protons, deuterons, tritons and fragments with z (>=) 2 and investigated their transverse momenta distributions in the laboratory frame and in the frame with (Sigma)(sub i)p(sub Ti) = 0 for all charged fragments. The nonmonotonic dependence of the degree of colinearity of the transverse momenta of alpha particles in the azimuthal plane of the reaction (sup 12)C (yields) 3(alpha) at 4,2 GeV/c per nucleon on the excitation energy of the carbon nucleus has been observed.
NTIS
Fragmentation; Carbon; Nucleons; Coherence

20010020775
Generalized theory of Raman scattering by bulk and surface polaritons
Nkoma, J. S.; Aug. 31, 1998; 27p; In English
Report No.(s): DE99-606815; IC-98/111; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We develop a generalized theory of Raman scattering by bulk and surface polaritons in the semi-infinite geometry. Bulk and surface response functions obtained by the linear response theory are presented. Using the fluctuation-dissipation theorem, we calculate the electric field fluctuations for both bulk and surface polaritons. The differential scattering cross sections for bulk and surface polaritons are derived, and found to be dependent on the incident and scattered frequencies, optical and crystal excitation

wave vectors, electric field fluctuations, and with Lorentzian lineshapes. We give explicit forms of the damping functions for both bulk and surface polaritons. For the case of the phonon type polaritons, our general formalism reduces to expressions reported previously, and the results are applied to GaP bounded by vacuum. Applications of the generalized formalism to other cases is discussed.
NTIS
Raman Spectra; Scattering Cross Sections

20010020786
Proton scattering on unstable nuclei: study of S-40(p,p') and Ar-43(p,p') reactions, development of detection system MUST *Proton scattering on unstable nuclei: study of*
Marechal, F.; Feb. 06, 1998; 133p; In French; In English
Report No.(s): DE99-605440; IPNO-T-98-02; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We measured for the first time the elastic and inelastic proton scattering on the S-40 unstable nucleus. The experiment was performed in inverse kinematics at the NSCL AT Michigan State University with a S-40 secondary beam bombarding a CH2 target at 30 MeV/A. We obtained the elastic scattering angular distribution and two points of the inelastic distribution to the first 2(sup +) excited state found to be located at 860 +/- 90 KeV. With a coupled channel analysis, the beta(sub 2) quadrupolar deformation parameter is found to be equal to 0.35 +/- 0.05. This value can be compared to 0.28 +/- 0.02 obtained by coulomb excitation. A macroscopic analysis allowed us to extract the neutron and proton transition matrix element ratio M(sub n)/M(sub p) which is equal to 1.88 +/- 0.38. This value, greater than N/Z, could indicate an isovector effect in the first 2(sup +) state excitation which could be due to a difference between the neutron and proton vibrations. The microscopic analysis gives the possibility to test the densities and the transition densities to the first 2(sup +) state. The calculated densities for the S-40 nucleus show a neutron skin. However the microscopic analysis yields a M(sub n)/M(sub p) ratio of 1.40 +/- 0.20. A similar elastic and inelastic proton scattering experiment allowed us to get a deformation parameter of 0.25 +/- 0.03 for the Ar-43 nucleus. To develop the study of direct reactions induced by radioactive beams at GANIL, we have developed and built, in collaboration with the CEA-Saclay and the CEA-Bruyeres, the new detector MUST.It is based on the silicon strip technology, and is dedicated to the measurement of recoiling light particles emitted in these reactions. The results obtained with a Ar-40 beam at 77 MeV/A, have shown the good performances of the detector for the particle identification as well as for the resolutions, and allow us to consider now a large experimental programme concerning these direct reactions induced by radioactive beams. These tests allowed us to establish a reference procedure to calibrate the detector and to analyse the data. We have also developed a simulation code in order to determine the best use conditions of MUST in the future experiments.
NTIS
Elastic Scattering; Inelastic Scattering; Nuclear Scattering; Neutrons; Protons

20010020789
PARRNe project. Geometry of converters and fission targets. Calculation of target equivalent thickness
Bajeat, O.; Clapier, F.; Mirea, M.; Dec. 31, 1998; 16p; In French; In English
Report No.(s): DE99-605437; IPNO-98-03; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Within the framework of PARRNe project (neutron rich radioactive nuclei production), this study aims at the estimation of the theoretical efficiency of targets according to their geometrical parameters and the distance from the neutron producing converter.
NTIS
Neutrons; Radioactivity; Nuclear Reactions; Particle Production

20010020891
Quark fragmentation into vector and pseudoscalar mesons at LEP
Anselmino, M.; Bertini, M.; Burgard, C.; Caruso, F.; Quintairos, P.; Sep. 30, 1997; 9p; In English
Report No.(s): DE99-605297; CBPF-NF-057/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Some data on the ratio of the ratio of vector + pseudoscalar mesons, V/(V + P), and the probability of helicity 0 vector states, (sub poo) (V), are now available from LEP. A possible relation between such two quantities and their interpretation in terms of polarized fragmentation functions are discussed; numerical estimates are given for the relative occupancies of K(sup 0) and K(sup 0*), D and D(sup *), B and B(sup *) states.
NTIS
Quarks; Fragmentation; Vector Mesons

20010020899

Phenomenological analysis of non-resonant charm meson decays

Bediaga, I.; Goebel, C.; Mendez-Galain, R.; Jul. 31, 1997; 14p; In English

Report No.(s): DE99-605289; CBPF-NF-039/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We analyze the consequences of the usual assumption of a constant function to fit non-resonant decays from experimental Dalitz plot describing charmed meson decays. We first show, using the D(sup +); K(sup 0) (pi)(sup +) (pi) (sup 0) decay channel as an example, how an inadequate extraction of the non- resonant contribution could yield incorrect measurements for the resonant channels. We analyze how the correct study of this decay will provide a test for the validity of factorization in D meson decays. Finally, we show how form factors that can be measured from the D(sup +)(sub s) yields (pi)(sup -) (pi)(sup +) (pi)(sup +) decay. We emphasize its relevance for the study of the decay (tau) yields v(sub t) 3(pi) and the extraction of the (alpha)(sub 1) meson width.

NTIS

Phenomenology; Mesons; Charm (Particle Physics); Particle Decay

20010020901

New model of gluon confinement

Novello, M.; De Lorenci, V. A.; Elbaz, E.; Jun. 30, 1997; 16p; In English

Report No.(s): DE99-605287; CBPF-NF-036/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper we present a model for the dynamics of a gauge field theory such that spin-one particles can be confined in a compact domain. We show that the property of confinement can be associated to the formation of a null surface identified to a horizon. This is due the presence of an effective geometry generated by the self-interaction of the gauge field that guides the wave propagation of the field. This phenomenon has a striking analog to the gravitational back hole in Einstein general theory of relativity, separating two domains of spacetime that can be trespassed only into one direction.

NTIS

Gluons; Confinement; Containment

20010021025

Limitations of the pulse-shape technique for particle discrimination in planar Si detectors

Pausch, G.; Seidel, W.; Moszynski, M.; Wolski, D.; Bohne, W.; Nov. 30, 1996; 8p; In English; Institute of Electrical and Electronic Engineers (IEEE) nuclear science symposium and medical imaging conference

Report No.(s): DE99-712775; FZR-157(PREPR.); No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Limitations of the pulse-shape discrimination (PSD) technique - a promising method to identify the charged particles stopped in planar Si-detectors - have been investigated. The particle resolution turned out to be basically determined by resistivity fluctuations in the bulk silicon which cause the charge-collection time to depend on the point of impact. Detector maps showing these fluctuations have been measured and are discussed. Furthermore we present a simple method to test the performance of detectors with respect to PSD. Another limitation of the PSD technique is the finite energy threshold for particle identification. This threshold is caused by an unexpected decrease of the total charge-collection time for ions with a short range, in spite of the fact that the particle tracks are located in a region of very low electric field.

NTIS

Charged Particles; Alpha Particles; Discrimination; Electrical Resistivity; Silicon

20010021026

Three dimensional momentum distributions of recoil-ions and photoelectrons

Ullrich, J.; Schmitt, W.; Doerner, R.; Jagutzki, O.; Mergel, V.; Oct. 31, 1996; 16p; In English; Joint annual meeting of the Optical Society of America, Inc. and interdisciplinary laser science conference

Report No.(s): DE99-712756; GSI-96-44(PREPR.); No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A novel high-resolution technique, the Multi-Electron-Recoil-Ion Momentum Spectroscopy, allows to determine in coincidence the three dimensional momentum vectors of the ion and up to three electrons created in any photo ionization event. At a solid angle of 4 (pi) the energy-resolutions for ions and electrons are +/- 2mu eV and +/- 10 meV, respectively.

NTIS

Recoil Ions; Three Dimensional Models; Angular Momentum; Distribution (Property)

20010021117 MSE Technology Applications, Inc., Butte, MT USA

Theoretical Analysis of the Electron Spiral Toroid Concept

Cambier, Jean-Luc, MSE Technology Applications, Inc., USA; Micheletti, David A., MSE Technology Applications, Inc., USA; December 2000; 44p; In English

Contract(s)/Grant(s): RTOP 522-17-41-20; PO L-8871

Report No.(s): NASA/CR-2000-210654; NASA-32; NAS 1.26:210654; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the analysis of the Electron Spiral Toroid (EST) concept being promoted by Electron Power Systems Inc. (EPS). The EST is described as a toroidal plasma structure composed of ion and electron shells. It is claimed that the EST requires little or no external confinement, despite the extraordinarily large energy densities resulting from the self-generating magnetic fields. The present analysis is based upon documentation made available by EPS, a previous description of the model by the Massachusetts Institute of Technology (MIT), and direct discussions with EPS and MIT. It is found that claims of absolute stability and large energy storage capacities of the EST concept have not been substantiated. Notably, it can be demonstrated that the ion fluid is fundamentally unstable. Although various scenarios for ion confinement were subsequently suggested by EPS and MIT, none were found to be plausible. Although the experimental data does not prove the existence of EST configurations, there is undeniable experimental evidence that some type of plasma structures whose characteristics remain to be determined are observed. However, more realistic theoretical models must first be developed to explain their existence and properties before applications of interest to NASA can he assessed and developed.

Author

Mathematical Models; Numerical Analysis; Toroidal Plasmas; Electron Spin

20010021319 NASA Marshall Space Flight Center, Huntsville, AL USA

Scattering/Transmission of Energetic H+,He+, and O+ Through a Thin Composite Si/Lexan/C Foil

Adrian, M. L., NASA Marshall Space Flight Center, USA; Hamilton, D. C., Maryland Univ., USA; Ho, G. C., Johns Hopkins Univ., USA; Moore, T. E., NASA Goddard Space Flight Center, USA; Pollock, C. J., Southwest Research Inst., USA; Magi, B. I., Arizona Univ., USA; Hsieh, K. C., Arizona Univ., USA; [2000]; 1p; In English, 15-19 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The need for a thin foil to serve both as an extreme ultraviolet (EUV) radiation attenuator and as a secondary electron generator for time-of-flight (TOF) instruments and energetic neutral atom (ENA) imagers has led us to test the scattering and transmission characteristics of a layered foil of nominal aerial thicknesses of 5 micrograms (raised dot) per square centimeter Si, 4 micrograms (raised dot) per square centimeter Lexan (C16H14O3), and 1 microgram (raised dot) per square centimeter C. We report the scattering/transmission results of subjecting this foil to H(+), He(+), and O(+) beams of energies less than or equal to 120 keV. The scattering of these particles, defined by the half-angular-width at half-maximum (HWHM), decreases with increasing energy and found to be 10 degrees for 10 keV H(+), 22 keV for He(+), and 100 keV for O(+). The 50% transmission threshold for these particles was found to be 3.9 keV for H(+), 8.6 keV for He(+), and 49.5 keV for O(+). Computer simulations of H(+)-foil interactions using SRIM96 agree well with the H(+) data, while yielding less scattering and higher transmission than indicated by the O(+) data.

Author

Lexan (Trademark); Composite Materials; Foils (Materials); Hydrogen Ions; Helium Ions; Oxygen Ions; Silicon; Energetic Particles; Ion Scattering

20010021329 NASA Marshall Space Flight Center, Huntsville, AL USA

Scattering/Transmission of Energetic H(sup +), He(sup +), and O(sup +) Through a Thin Composite Si/Lexan/C Foil

Adrian, M. L., NASA Marshall Space Flight Center, USA; Hamilton, D. C., Maryland Univ., USA; Ho, G. C., Johns Hopkins Univ., USA; Moore, T. E., NASA Goddard Space Flight Center, USA; Pollock, C. J., Southwest Research Inst., USA; Magi, B. I., Arizona Univ., USA; Hsieh, K. C., Arizona Univ., USA; [2000]; 1p; In English, 18 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The need for a thin foil to serve both as an extreme ultraviolet (EUV) radiation attenuator and as a secondary electron generator for time-of-flight (TOF) instruments and energetic neutral atom (ENA) imagers has led us to test the scattering and transmission characteristics of a layered foil of nominal aerial thicknesses of 5 microns/sq cm Si, 4 microns/sq.cm Lexan ((C16)H(14)O3), and 1 micron/sq.cm C. We report the scattering and transmission results of subjecting this foil to H(sup +), He(sup +), and O(sup +) beams of energy less than 120 keV. The scattering of these particles, defined by the half-angular-width at half-maximum (HWHM), decreases with increasing energy and is found to be 10 deg for 10 keV H(sup +), 22 keV for He(sup +), and 100 keV for O(sup +). The 50% transmission threshold for these particles was found to be 3.9 keV for H(sup +), 8.6 keV for He(sup +),

and 49.5 keV for O(sup +). Additionally, ion transmission shows evidence of resonance scattering from a rectangular potential independent of incident ion mass. Particularly evident is a local transmission minimum at 70 keV possessing a Gaussian-width of 20 keV. For incident energies below 50 keV, computer simulations of H+-foil interactions using SRIM96 agree well with the H(sup +) data, while yielding less scattering and higher transmission than indicated by the O(sup +) data.
Author
Energy Transfer; Hydrogen; Helium; Oxygen; Foils (Materials); Computerized Simulation; Lexan (Trademark); Silicon

73
NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see 93 Space Radiation. For atomic and molecular physics see 72 Atomic and Molecular Physics. For elementary particle physics see 77 Physics of Elementary Particles and Fields. For nuclear astrophysics see 90 Astrophysics.

20010020359 Notre Dame Univ., IN USA
Dynamics of Hypervelocity Collisions at the Gas/Surface Interface ***Final Report, 1 Oct. 1999-30 Sep. 2000***
Jacobs, Dennis C.; Sep. 2000; 24p; In English
Contract(s)/Grant(s): F49620-98-1-0029
Report No.(s): AD-A385779; AFRL-SR-BL-TR-01-0022; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A series of hyperthermal energy, ion/surface scattering experiments were performed. These studies examined and characterized some of the many processes occurring in energetic gas/surface collisions. In the scattering of Ne+ on Si(001), the precise amount of momentum, transferred to the surface upon collision, was measured under various conditions. Models that incorporate image charge interactions and inelastic energy loss were successfully applied to simulate the data. The first measurement of atom abstraction at an oxide surface was recorded in the scattering of NO+ on O/Al(111). Measurement of the product yield and energy distribution as a function of incident energy revealed the detailed reaction mechanism. The growth and erosion of SiO2 thin films under O+ bombardment was studied. Isotopic labeling experiments combined with mass-, energy-, and angular-resolved detection provided compelling evidence for a direct Eley-Rideal abstraction of adsorbed oxygen by incident O+ ions. This reaction pathway competes directly with sputtering channels in the formation of scattered O2- and SiO+. The conclusions from this work help in the modeling of spacecraft interactions with the LEO environment, e.g., vehicle drag, spacecraft charging, oxidation/degradation of exposed surfaces, and the formation of signatures.
DTIC
Gas-Solid Interfaces; Hypervelocity Impact; Particle Collisions; Molecular Ions; Ion Scattering; Earth Orbital Environments

20010020429 Romanian Center for Induced Gamma Emission, Bucharest, Romania
Study of Productivity of Tantalum Spallation by Protons for Accumulation of the Hf-178m2 Isomeric Nuclei ***Final Report***
Popescu, Ioan-Lovitz; Oct. 25, 2000; 16p; In English
Contract(s)/Grant(s): F61775-99-W-E030
Report No.(s): AD-A385573; EOARD-SPC99-4030; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report results from a contract tasking Romanian Center for Induced Gamma Emission as follows: The contractor will establish the exact position of the gateway state(s) above the 31 year lifetime, high-K isomeric state in the 178Hf nucleus.
DTIC
Hafnium; Spallation; Productivity; Gamma Ray Lasers

20010020599
Expansion and evaporation of hot nuclei: Comparison between semi-classical and quantal mean-field approaches
Lacroix, D.; Chomaz, P.; Dec. 31, 1998; 42p; In English
Report No.(s): DE99-602945; GANIL-P-98-04; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A general discussion of the mean field dynamics of finite nuclei prepared under extreme conditions of temperature and pressure are presented. The prediction of semi-classical approximation is compared with complete quantum simulations. Many features of the dynamics are carefully studied such as the collective expansion, the evaporation process, the different time-scale. This study points out many quantitative differences between quantum and semi-classical approaches. Part of the differences are related to numerical features inherent in semi-classical simulations but most of them are a direct consequence of the non treatment of

nuclei as quantal objects. In particular, it is shown that because of a too strong damping in semi-classical approaches the expansion of hot nuclei is quenched and the speed of the collective motion reduced.
NTIS
Hartree Approximation; Mathematical Models; Evaporation; Damping; Ionic Collisions; Nuclei (Nuclear Physics); Nuclear Reactions

20010020600
Phase transition with an isospin dependent lattice gas model
Gulminelli, F.; Chomaz, P.; Dec. 31, 1998; 17p; In E
Report No.(s): DE99-602946; GANIL-P-98-06; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The nuclear liquid-gas phase transition is studied within an isospin dependent Lattice Gas Model in the canonical ensemble. Finite size effects on thermodynamical variables are analyzed by a direct calculation of the partition function, and it is shown that phase coexistence and phase transition are relevant concepts even for systems of a few tens of particles. Critical exponents are extracted from the behaviour of the fragment production yield as a function of temperature by means of a finite size scaling. The result is that in a finite system well defined critical signals can be found at supercritical (Kertesz line) as well as subcritical densities. For isospin asymmetric systems it is shown that, besides the modification of the critical temperature, isotopic distributions can provide an extra observable to identify and characterize the transition.
NTIS
Heavy Ions; Ionic Reactions; Charge Transfer; Molecular Interactions; Isotopic Spin

20010020629
Fast and high-energy neutron detection with nuclear track detectors: Results of the European joint experiments 1992/1993
Schraube, H.; Alberts, W. G.; Weeks, A. R.; Dec. 31, 1997; 141p; In English
Report No.(s): DE99-712799; GSF-15/95; EURADOS-1995-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Under the auspices of EURADOS, the European radiation dosimetry group, seventeen recognized laboratories engaged in the field of individual neutron dosimetry with passive track detectors participated in an international comparative experiment. A number of twenty-seven detector systems, predominantly etched track detectors with the material PADC (poly allyl diglycol carbonate), were employed by the participating laboratories. Quasi-monoenergetic neutrons were provided for irradiations free-in-air and on front of a PMMA phantom by the GSF (Forschungszentrum fuer Umwelt und Gesundheit, Neuherberg, Germany) and by the PTB (Physikalisch-Technische Bundesanstalt, Braunschweig, Germany). High energy irradiations were conducted by the PSI (Paul-Scherrer Institut, Villigen, Switzerland). The results of the on-phantom irradiations were used to derive energy and angular responses of the track detectors, those of the free-in-air irradiations to obtain data for the linearity characteristics of the response with dose. The report contains a short description and the original data of the participating laboratories, displays the irradiation and reference conditions, and provides an over-all evaluation. Emphasis is placed on the quantitative evaluation of the background characteristics and of the non-linearity observed with most of the systems employed which limits their useful dose-range of application.
NTIS
Detection; Fast Neutrons; Radiation Protection; Nuclear Physics

20010020630
Strategy for achieving high target power density with a modified SIS 18 and the new high current injector (U28(+))
Mueller, R. W.; Spiller, P.; Dec. 04, 1996; 13p; In English
Report No.(s): DE99-712773; GSI-96-07; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We develop a strategy and list the requirements of how to achieve the full potential of SIS 18 for performing plasma and radiation physics experiments. The basis is the status as it will exist in 1999, plus a fast-buncher cavity which has been already fore seen, and for which space in the ring is still reserved. Plasma experiments can also be done with modest fast bunching, using the existing RF cavities. We attempt to make use of the electron cooler under construction for ion velocities up to 60 MeV/u. The transfer line from the linac to SIS should contain an active debuncher, and a linac-frequency cavity should be installed in the ring. This additional cavity can be used to attain the best possible momentum definition in the single-turn injection mode.
NTIS
Plasma Physics; Plasma Radiation; Radiant Flux Density

20010020639

Luminosity monitor studies for TESLA

Napoly, O.; Schulte, D.; Nov. 30, 1997; 16p; In English

Report No.(s): DE99-609070; CEA-DAPNIA-SEA-97-14; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The feasibility of a luminosity monitor based on a radiative Bhabha detector is investigated in the context of the TESLA linear collider. Another option based on low energy e(sup +)e(sup -) pair calorimetry is also discussed. In order to monitor the beam parameters at the interaction point by optimizing the luminosity, these detectors should be able to provide a relative measurement of the luminosity with a resolution better that 1% using a fraction of the TESLA bunch train.

NTIS

Luminosity; Monitors

20010020676

Fission width and neutron induced fission cross section of the U-234 in the energy region from 1 to 1000 eV

Borzakov, S. B.; Zamyatin, Y.; Zejnalov, S.; Konovalov, V.; Panteleev, T.; Dec. 31, 1998; 11p; In Russian

Report No.(s): DE99-602132; JINR-R-3-97-398; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The results of the measurements of the cross section of the resonance neutron induced fission carried out on the IBR-30 pulse booster are presented. The measurements were done using the time-of-flight technique. Fission events were detected by multisectional pulse ionization chamber, containing about 100 mg of U-234 and 25 mg U-235 for neutron flux measurements. The fission width was calculated in the resolved resonance region (below 200 eV) using a square method. The cross section of the fission in the energy region below 1000 eV is shown.

NTIS

Fission; Uranium 234; Neutrons; Nuclear Reactions; Absorption Cross Sections; Neutron Cross Sections; Nuclear Fuels

20010020682

Measurement of the nuclear capture rate of the negative muons for the (sup 84)Kr and (sup 136)Xe isotopes

Mamedov, T. N.; Barsov, S. G.; Getalov, A. L.; Dec. 31, 1998; 11p; In Russian; In English

Report No.(s): DE99-602126; JINR-R-15-97-391; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The lifetime of the negative muon in 1S-state in (sup 84)Kr and (sup 136)Xe isotopes was measured for the first time: (tau)((sup 84)Kr)=139.2 (+-) 2.9 ns, (tau)((sup 136)Xe)=111.0 (+-) 4.6 ns, which corresponds to the nuclear capture rate: (Lambda)(sub c)((sup 84)Kr)=6.75 (+-) 0.15 (mu)s(sup -1), (Lambda)(sub c) ((sup 136)Xe)=8.6 (+-) 0.4 (mu)s(sup -1). For the Kr isotopes the theoretical calculations of the nuclear capture rate of the negative muon were carried out. The experimental data are compared with the theoretical ones.

NTIS

Nuclear Physics; Nuclear Capture; Muons; Xenon Isotopes; Krypton Isotopes

20010020717

Research and development of apparatus for nuclear physics investigations at accelerators

Koblik, Y.; Jan. 31, 1998; 77p; In Russian; In English

Report No.(s): DE98-621522; INIS-UZ-051; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The materials of work which are devoted to the research development of the methods and apparatus to carry out the experiments in the field of nuclear physics at low and intermediate energy region are presented in the abstract. For the searching of the narrow resonance structures in the spectra of invariant masses of the A(p, 2p)X reaction products the double - arm scintillation spectrometer with luminosity 0,2 sr and resolution 1,5% was created. This spectrometer has 19 cones for registration of particles up to 4 targets with various isotope composition simultaneously irradiated by proton beam in experiments at accelerator TRIUMF (Vancouver, Canada). In the energy region of beam particles up to 20 MeV/N the complex development of experimental method of measurements (method of spectra superposition) and apparatus are presented which are realized at the accelerator U-150-II (Tashkent) in investigations of the structure anomalies in cross-sections of products from scattering of protons by nuclei with resolution about 0,1%. The abilities of the method and apparatus (including magnetic spectrograph 'Apel'sin' proportional coordinate chamber and IBM AT on-line) were demonstrated in the measurement of energy dependence of elastic protons scattering by carbon nuclei in the energy range 15-19,5 MeV with energy resolution (<=) 20 keV. The materials of particles and radiation coordinate detection are the results of original development of solid and gas detectors and systems of various physical directions. In the abstract the spectrometers on the base of semiconductor coordinate detectors, spark and proportional chambers ar described for

the work at the accelerators and at the space stations and ships. The new methods of investigation of annihilation photons and and the formation of object image in positron emission tomograph are also presented.
NTIS
Research and Development; Nuclear Physics; Equipment; Semiconductors (Materials)

20010020718
Coulomb break up of the light nucleus into two fragments in the field of heavy ion going through resonance state
Ehrgashbaev, K.; Feb. 28, 1998; 77p; In Russian; In English
Report No.(s): DE98-621521; INIS-UZ-050; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In the frame of the consistent three-body approach the influence of the three-body Coulomb dynamics on the behavior of the differential cross section of the break-up reactions going through resonance is investigated. The resonance curve is calculated for two following reactions: (sup 12)C((sup 3)He, d)(sup 13)N*(yields) (sup 12)C+p, (sup 16)O((sup 3)He,d)(sup 19)F* (yields) (sup 18)O+p at the different colliding energies. The results of the calculations are compared with the calculations without taking into account three-body Coulomb effect. The Coulomb break-up A(a,bc)A going through resonance state of the particle a is investigated in the framework of the three- body approach. The three-body Coulomb dynamics is taken into account at deriving the expression for the triple-differential cross section. The numerical calculations are performed for the Coulomb break-up of light nuclei in the Coulomb field of a heavy ion as (sup 208)Pb((sup 6)Li,(alpha)d)(sup 208) Pb, (sup 208)Pb((sup 7)Li,(alpha)t)(sup 208)Pb and (sup 208)Pb((sup 7)Be, (alpha) (sup 3)He)(sup 208)Pb reactions. The results of the calculations are compared with the experimental data.
NTIS
Nuclear Physics; Fragments

20010020781
Heat generation and temperature-rise in ordinary concrete due to capture of thermal neutrons
Abdo, E. A.; Amin, E.; Dec. 31, 1997; 19p; In English
Report No.(s): DE99-606799; AREAEA-345; No Copyright; Avail: Department of Energy Information Bridge

The aim of this work is the evaluation of the heat generation and temperature-rise in local ordinary concrete as a biological shield due to capture of total thermal and reactor thermal neutrons. The total thermal neutron fluxes were measured and calculated. The channel number 2 of the ETRR-1 reactor was used in the measurements as a neutron source. Computer code ANISN (VAX version) and neutron multigroup cross-section library EURLiB-4 was used in the calculations. The heat generation and temperature-rise in local ordinary concrete were evaluated and calculated. The results were displayed in curves to show the distribution of thermal neutron fluxes and heat generation as well as temperature-rise with the shield thickness. The results showed that, the heat generation as well as the temperature-rise have their maximum values in the first layers of the shield thickness.
NTIS
Heat Generation; Thermal Neutrons; Thermal Reactors; Nuclear Physics

20010020782
Attenuation of neutrons and gamma-rays in homogeneous and multilayered shields
Abdo, A. E.; Megahid, R. M.; Dec. 31, 1997; 28p; In English
Report No.(s): DE99-606798; AREAEA-344; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Measurements were carried-out to compare the attenuation properties of homogeneous shields and shields of two layers and three layers for fast neutrons and total gamma-rays. These were performed by measuring the fast neutron and total gamma-ray spectra behind homogeneous shields of magnetite-limonite, ilmenite-ilmenite and magnetite-magnetite concretes. The two layers assembly consists of iron and one of the above mentioned concretes, while the three layers shield consists of water, iron and one of the previously mentioned concretes. All measurements were carried-out using a neutron-gamma spectrometer with stilbene scintillator coupled to a fast photo multi player tube. Separation between pulses of recoil protons and recoil electrons was achieved by a pulse shape discrimination technique.
NTIS
Attenuation; Fast Neutrons; Gamma Rays; Concretes

20010020787
Neutron production in a thick target by means of a high energy proton beam
Menard, S.; Jan. 06, 1998; 121p; In French; In English
Report No.(s): DE99-605439; IPNO-T-98-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The energy and angular distributions of neutrons produced by bombarding thick targets with protons from 0.8 GeV up to 1.6 GeV have been measured at the Saturne synchrotron facility using time-of-flight technique. Measurements using targets of various lengths (40, 65 and 105 cm), various diameters (10 and 20 cm (lead, iron), 15 cm (tungsten)) and several compositions (iron, lead, tungsten) are discussed. These experimental data are compared with theoretical simulations carried out using the TIERCE code. The neutron spectra calculated by using TIERCE systematically underestimate the measured distributions. A simple model has been developed to calculate energy distributions and multiplicities of the neutrons emitted in the interaction of a high-energy proton beam with a thick target. The predictions of this model are compared with experimental data.
NTIS
Neutrons; Neutron Spectra; Proton Beams; Nuclear Reactions; Particle Production

20010020788
Neutrons produced in thick targets of Be, U-238 and C by means of 100 MeV/A deuterons and 95 MeV/A Ar-36. Dose rate due to uranium activation *Neutrons produced in thick targets of Be,*
Pauwels, N.; Proust, J.; Clapier, F.; Gara, P.; Mirea, M.; Dec. 31, 1998; 10p; In French; In English
Report No.(s): DE99-605438; IPNO-98-04; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This study presents the results of two experiments, one lead in GANIL facilities and the other at Saturn National Laboratory. Both aim at neutron production. The energy spectra of neutrons are given for different targets and ion beams. The efficiency of deuteron beams in term of neutron production is reinforced. The neutron flux appears to be higher in any forward direction when using a beryllium target. In order to optimize shielding the neutron attenuation length in 15 cm thick concrete slab is revalued.
NTIS
Neutrons; Neutron Sources; Uranium 238; Particle Production; Nuclear Reactions; Energy Spectra; Targets; Ion Beams

20010020794
Comparison of threshold reaction cross sections for the Ti, V, Cr, Fe, Ni, Cu, and Zn isotopes from evaluated data libraries
Blokhin, A. I.; Manokhin, V. N.; Nasyrova, S. M.; Sep. 30, 1998; 45p; In e
Report No.(s): DE99-605338; INDC(CCP)-412; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Evaluated excitation functions for various threshold reactions on Ti, V, Cr, Ge, Ni, Cu and Zn isotopes are compared to reveal discrepancies between different nuclear data libraries. The recommended excitation functions for (n,p), (n,np), (N,(alpha)) and (n,2n) reactions, evaluated on the basis of empirical systematics are given for comparison to facilitate selection of a more reliable data. The available experimental data are also plotted.
NTIS
Excitation; Neutrons; Nuclear Reactions

20010020795
Evaluation of average neutron resonance parameters of actinides with the account of experimental resolution and discrimination threshold. Final report of research contract 9503/RB
Porodzinskij, Y.; Sukhovitskij, E.; Maslov, V. M.; Jun. 30, 1998; 47p; In e
Report No.(s): DE99-605337; INDC(BLR)-012; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Average neutron resonance parameters are used for adjusting of input data for optical and statistical model calculations. Unfortunately, the current state of existing average resonance parameter libraries does not satisfy the accuracy requested for evaluation of nuclear reaction data. Due to the drawbacks of the methods used, discrepancies greater than quoted errors occur between average resonance parameter values in Beijing, Bologna, Brookhaven and Obninsk libraries. In the present work, we developed a sophisticated and physically transparent method for determination of average neutron resonance parameters from experimental data sets. The main idea of it is that experimentally missed distances do not disappear, but are added to the neighbors. New evaluation of average resonance parameters Th-229 - Cf-252 was performed, accounting for the missing levels caused by poor experimental energy resolution and discrimination threshold. Obtained values of average level spacings produce a smooth systematic of the main level density parameter.
NTIS
Actinide Series; Neutrons; Chemical Reactions; Nuclear Reactions

20010020890
Importance of the inner potential barrier in nuclear spontaneous cold fission processes
Duarte, S. B.; Tavares, O. A. P.; Goncalves, M.; Sep. 30, 1997; 11p; In English
Report No.(s): DE99-605298; CBPF-NF-059/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The relevance of the inner part of the potential barrier in an effective model to describe the pre-scission phase in nuclear disintegration process is discussed under the assumption of spherical fragments. Although for alpha decay process the inner part of the potential barrier can be neglected, this is not the case for heavier cluster radioactivity and spontaneous cold fission processes. For the latter one, we remark that the dinuclear phase may contribute with the major part to Gamow's penetrability factor in cold fission yield calculations.
NTIS
Nuclear Fission; Fission; Alpha Decay; Radioactivity

20010020893
Photofission cross section and fissility of pre-actinide and intermediate-mass nuclei by 120- and 145-MeV Compton backscattered photons
Terranova, M. L.; Kezerashvili, G.; Milov, A. M.; Sep. 30, 1997; 28p; In English
Report No.(s): DE99-605295; CBPF-NF-055/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Cross section measurements for photofission induced in Bi-209, (sup natP)b, Au-197, (sup nat) Pt, nat(sub w), Ta-181, V-51 and (sup nat) Ti by 120- and 145-MeV quasi-monochromatic photon beams have been performed at the ROKK-1M facility (BINP, Novosibirsk). The fission yields have been obtained using Makrofol sheets as solid-state fission track detectors. Nuclear fissility values have been deduced on the basis of Levinger's modified quasi-deuteron model of photonuclear interaction, and compared with available literature data. The trend of fissility in the 60-145 MeV energy range has been analysed for various target nuclei as function of energy and of parameter Z(sup 2)/A.
NTIS
Transuranium Elements; Photonuclear Reactions; Nuclear Reactions; Nuclear Physics; Fission

20010020903
Anisotropy of favoured alpha transitions producing even-even deformed nuclei
Tavares, O. A.; May 31, 1997; 14p; In English
Report No.(s): DE99-605285; CBPF-NF-033/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The anisotropy in favoured alpha transitions which produce even-even deformed nuclei is discussed. A simple, Gamow's-like model which takes into account the quadrupole deformation of the product nucleus has been formulated to calculate the alpha decay half-life. It is assumed that before tunneling into a purely Coulomb potential barrier the two-body system oscillated isotropically, thus giving rise to an equivalent, average preferential polar direction (theta)(sub 0) (referred to the symmetry axis of the ellipsoidal shape of the product nucleus) for alpha emission in favoured alpha transitions of even-even nuclei.
NTIS
Anisotropy; Nuclear Deformation; Even-Even Nuclei

20010020910
Radiative correction to coincidence experiments
Sargsyan, M.; Dec. 31, 1991; 25p; In English
Report No.(s): DE99-604279; YERPHI-1331-26-91; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The method of radiative corrections are presented for the reaction e + A (yields) e + B + C where the scattered electron and particle B (which is much more heavier than electron) are registered in coincidence. The Bremsstrahlung processes are considered in the field of nucleus on which interactions take place as well as in the matter of target though which electrons passed before and after interaction. The effect of multiphoton emission is taken into account too. The obtained formulas make it possible to account the radiative distortion of inelastic spectra by the radiative process of lower final harmonic mass W (radiative tail).
NTIS
Nuclear Physics; Correction

20010020913
Evaluation of average neutron resonance parameters of actinides with the account of experimental resolution and discrimination threshold ***Final Report, 15 Dec. 1996 - 14 Dec. 1997***
Sukhovitskij, E.; Jun. 30, 1998; 9p; In English
Report No.(s): DE99-604256; IAEA-R-9503-F; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
New evaluation of average resonance parameters for 32 isotopes of the actinide region ((sup 229)Th-(sup 252)Cf) was completed. Obtained values of average level spacings produce a smooth systematics of the main level density parameter. The results

were included into the Starter File of the Reference Input Parameter Library (segment Average Neutron Resonances) and officially released on 15 May 1998.
NTIS
Nuclear Physics; Actinide Series; Resonance

20010020914
Development of nuclear theory and computer code for the evaluation of nuclear cross-sections relevant to beam monitoring used in medical radioisotope production and fusion technology ***Final Report, 15 Dec. 1995 - 14 Dec. 1997***
Gul, K.; Jun. 30, 1998; 40p; In English
Report No.(s): DE99-604255; IAEA-R-8993-F; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Nuclear reactions induced by light charged particles in copper are of importance as monitors in medical radioisotope production. Careful evaluations are needed for the excitation functions of activation reactions in copper with protons, 4-He and 3-He from the point of view of their use as beam flux monitors in the incident energy range below 30 MeV. The method used in the present work was based on theoretical calculations and comparison with experimental data. Calculations were performed using the Hauser-Feshbach statistical model and the preequilibrium hybrid model. to this end, the codes HFMOD and PREMOD developed at PINSTECH, Pakistan, were employed. Careful selection of optical model parameters, nuclear level densities as well as discrete levels was performed. Obtained were 10 excitation functions for production of radioactive isotopes on 63-Cu and 65-Cu with p, 4-He and 3-He: Protons in 3-25 MeV range, 63-Cu(p,n) 63-Zn, 63-Cu(p,2n) 62-Zn, 65-Cu(p,n) 65- Zn; Alphas in 8-27 MeV energy range, 63-Cu(a,n) 66-Ga, 63-Cu(a,2n) 65-Ga, 63- Cu(a,np) 65-Zn, 65-Cu(a,n) 68-Ga, 65-Cu(a,2n) 67-Ga; 3-He in 7-20 MeV range, 63- Cu(3He,n) 67-Ga, 65-Cu(3He,2n) 66-Ga.
NTIS
Nuclear Physics; Computer Programs; Nuclear Reactions

20010020915
Development of data file with partial level densities for nuclear data calculations ***Final Report, 15 Dec. 1995 - 14 Dec. 1997***
Avrigeanu, M.; Jun. 30, 1998; 47p; In English
Report No.(s): DE99-604254; IAEA-R-8886-F; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The set of FORTRAN77 functions for partial nuclear level densities was developed. The resulting computer code includes 14 formalisms to calculate partial (particle-hole) nuclear level densities. These quantities are of importance as input for nuclear model calculations of nuclear reaction data.
NTIS
Nuclear Physics; Computer Programs

20010021013
Numerical solution of non-linear diffusion problems
Carmen, A.; Ferreri, J.; Dec. 31, 1998; 9p; In English; 11th; Reactor Physics and Thermal Hydraulics, Unknown
Report No.(s): DE98-636093; ARN-PI-3/98; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This paper presents a method for the numerical solution of non-linear diffusion problems using finite-differences in moving grids. Due to the presence of steep fronts in the solution domain and to the presence of advective terms originating in the grid movement, an implicit TVD scheme, first order in time and second order in space has been developed. Some algebraic details of the derivation are given. Results are shown for the pure advection of a scalar as a test case and an example dealing with the slow spreading of viscous fluids over plane surfaces. The agreement between numerical and analytical solutions is excellent.
NTIS
Diffusion; Nonlinearity; Numerical Analysis; Reactor Physics; Algebra

20010021027
Radiation technology facilities operating at the italian ENEA-Casaccia research center
Tata, A.; Festinesi, A.; Rosa, R.; Apr. 30, 1998; 12p; In English; 9th; European symposium on improved oil recovery
Report No.(s): DE99-712667; ENEA-RT-INN-98-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The ENEA Casaccia Research Center, 20 km far from Rome, is the main Italian technological research Center, with more than 2000 scientists involved in several advanced research fields (materials, energy, environment, etc.). Within the frame of radiation technology, three main facilities are in service at full power at the Casaccia research Center: a 1 MW TRIGA Mark II reactor (RC-1); a 5 kW fast source reactor (TAPIRO); a 3.7 x 10(exp 15) Bq Cobalt-60 irradiation plant (CALLIOPE). Main R-D pro-

grams carried out regard medical radioisotopes and radio trackers production, neutron radiography, neutron activation analysis, radiation damage analysis, neutron diffractometry, foodstuffs treatment, crosslinking processes, wastes (hazardous, chemical, hospital) processing. The paper provides a features description of utilized facilities and reports main present carried out projects.
NTIS
Irradiation; Fast Nuclear Reactors

20010021034

Multifragmentation induced by light relativistic projectiles and heavy ions: similarities and differences

Karnaukhov, V. A.; Avdeev, S. P.; Kuznetsov, V. D.; Dec. 31, 1998; 23p; In English

Report No.(s): DE99-602115; JINR-E-7-98-8; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The experimental data on fragment multiplicities, their energy and charge distributions, the emission times are considered for the nuclear multifragmentation process induced by relativistic light projectiles (protons, helium) and heavy ions. With light projectiles, the multifragmentation is a pure 'thermal' process, well described by the statistical models. Heavy-ion- induced multifragmentation is influenced by dynamic effects related first of all to the compression of the system in the collision. But statistical models can also be applied to rendering the partition of the system if the excitation energy is less than 10 MeV/nucleon and compression is modest. For the central collision of heavy ions the statistical approach fails to describe the data.
NTIS
Fragmentation; Nuclear Physics

20010021035

Radiation of charge uniformly moving in medium

Afanas'ev, G. N.; Kartavenko, V.; Dec. 31, 1998; 35p; In English

Report No.(s): DE99-602114; JINR-E-4-97-393; No Copyright; Avail: Department of Energy Information Bridge

We analyze how the frequency dependence of the dielectric permittivity affects the electromagnetic field radiated by a point charge uniformly moving in medium. It turns out that a moving charge radiates at every velocity. We study the space distribution of the electromagnetic field and show that its oscillations are due to the time-dependent medium polarization induced by the moving charge. Spectral distributions of the radiated energy and the photon number are given. Consequences arising from the choice of polarization different from the usual one are discussed. The analysis of the Kramers-Kronig dispersion relations for the treated problems is given.
NTIS
Nuclear Physics; Electromagnetic Fields

20010021062

Coulomb corrections for interferometry analysis of expanding hadron systems

Sinyukov, Y.; Lednicky, R.; Akkelin, S. V.; Pluta, J.; Erazmus, B.; Dec. 31, 1998; 14p; In English

Report No.(s): DE99-602986; SUBATECH-98-01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The problem of the Coulomb corrections to the two-boson correlation functions for the systems formed in ultra-relativistic heavy ion collisions is considered for large effective volumes predicted in the realistic evolution scenarios taking into account the collective flows. A simple modification of the standard zero-distance correction (so called Gamow or Coulomb factor) has been proposed for such a kind of systems. For (pi)(sup +)(pi)(sup +) and K(sup +)K(sup +) correlation functions this approximate analytical approach is compared with the exact numerical results and a good agreement is found for typical conditions at SPS, RHIC and even LHC energies.
NTIS
Correction; Interferometry; Nuclear Physics

20010021063

Particle correlations in ultra-relativistic heavy-ion experiments STAR at RHIC and ALICE at LHC

Martin, L.; Erazmus, B.; Roy, C.; Lednicky, R.; Lyuboshitz, V.; Dec. 31, 1998; 16p; In English

Report No.(s): DE99-602987; SUBATECH-98-02; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Particle interferometry is one of the tools proposed to extract quark-gluon plasma signatures in ultra-relativistic heavy-ion collisions at RHIC and LHC. From an experimental point of view, STAR and ALICE experiments installed at these facilities will

provide exceptional conditions to study particle correlation studies. Some of the new possibilities open by these experiments are investigated.
NTIS
Correlation; Heavy Ions; Nuclear Physics

20010021106
Radial heat conduction in a power reactor fuel element
Ventura, M.; Dec. 31, 1998; 32p; In Spanish; In English
Report No.(s): DE99-604241; ARN-PI-22/98; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Two radial conduction models, one for steady state and another for unsteady state, in a nuclear power reactor fuel element are developed. The objective is to obtain the temperatures in the fuel pellet and the cladding. The lumped-parameter hypothesis are adopted to represent the system. Both models are verified and their results are compared with similar ones. A method to calculate the conductance in the gap between the UO2 pellet and the clad and its associated uncertainty is included in the steady state model.
NTIS
Nuclear Power Reactors; Conductive Heat Transfer; Nuclear Fuel Elements; Nuclear Power Plants

20010021109
Production of (pi)(sup -) -mesons in the fragmentation and central regions of dC-interactions at 1 GeV per nucleon
Gulkanyan, G. R.; Kakoyan, V.; Dec. 31, 1991; 24p; In Russian; In English
Report No.(s): DE99-604246; EFI-1333-28-91; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The inclusive spectra of (pi)(sup -) -mesons in dC-interactions are measured at 1 GeV per nucleon. The data are compared with the ''counting rule'' predictions for the deuteron and carbon fragmentation and with the recently observed features of the central pion production in the multinucleon nucleus-nucleus collisions 15 refs.
NTIS
Nuclear Physics; Mesons; Particle Production

74
OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20010020010 Naval Air Warfare Center, Aircraft Div., Patuxent River, MD USA
Modes in Chiral Core Planar Waveguides: Transition from Linear to Circular Polarization
Herman, Warren; Jan. 1999; 12p; In English
Report No.(s): AD-A385626; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The general solution for modes in an asymmetric planar waveguide with an isotropic chiral core is given in terms of a pair of parameters related to the eccentricity of the polarization ellipse for the transverse electric field. This formulation provides insight into the transition, with increasing chirality of the core, from TE/TM modes to right-handed (RHC) and left-handed (LHC) circular polarization modes. The mode properties as a function of waveguide thickness and of frequency are discussed in detail. In addition to the usual cutoff at a minimum thickness (and maximum wavelength), left-handed elliptical modes are found to experience a cutoff at a mode-dependent maximum thickness (and minimum wavelength). The limiting case of a symmetric waveguide is also discussed.
DTIC
Chirality; Chiral Dynamics; Asymmetry; Linear Polarization; Circular Polarization

20010020013 California Univ., Electrical Engineering Dept., Los Angeles, CA USA
Testbed for Multi-Wavelength Optical Code Division Multiplexing Based on Passive Linear Unitary Filters *Final Report, 15 Sep. 1996-14 Sep. 1998*
Yablonovitch, Eli; Oct. 10, 2000; 2p; In English
Contract(s)/Grant(s): F49620-96-1-0453
Report No.(s): AD-A385636; KD84FINTECH-1; AFRL-SR-BL-TR-00-0682; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The bandwidth demanded for Internet traffic has been constantly growing in response to more bandwidth hungry applications such as high-resolution motion picture transmission. An optical fiber has about 10 tera-bits per second (Tbps) available bandwidth and is the ideal medium to link tomorrow's bandwidth hungry applications. The equipment purchased under this grant has permitted UCLA to purchase a number of broad-band optical components, including especially some unique code division multiplexing filters that permitted us to demonstrate optical code division multiplexing of a multi-wavelength signal source.
DTIC
Test Stands; Wavelength Division Multiplexing; Code Division Multiplexing

20010020072 NASA Marshall Space Flight Center, Huntsville, AL USA
Mirror Technology Development at MSFC for the Next Generation Space Telescope and Other Space Telescope Missions
Stahl, H. Philip, NASA Marshall Space Flight Center, USA; Smith, W. Scott, NASA Marshall Space Flight Center, USA; [2001]; 1p; No Copyright; Avail: Issuing Activity; Abstract Only

Large-aperture low-areal-density mirrors are critical to the success of the Next Generation Space Telescope (NGST) as well as other related space missions such as the Space Based Laser (SBL). Currently fabrication technology has demonstrated areal densities of 50 kg/sq m. NASA and its DOD partners are conducting a series of risk reduction projects to demonstrate mirror fabrication technology for mirror systems with areal densities of 15 kg/sq m. This talk will present an overview of these risk reduction experiments.
Author
Mirrors; Lasers; Space Missions

20010020396 NASA Goddard Space Flight Center, Greenbelt, MD USA
NASA'S Next Generation Space Telescope Visiting a Time When Galaxies were Young
Seery, Bernard D., NASA Goddard Space Flight Center, USA; Smith, Eric P., NASA Goddard Space Flight Center, USA; Coulter, Daniel R., Jet Propulsion Lab., California Inst. of Tech., USA; Capps, Richard W., Jet Propulsion Lab., California Inst. of Tech., USA; [1999]; 9p; In English; 16th; ILS-16: Laser Science, 22-26 Oct. 1999, Providence, RI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

With the discovery of galaxies that existed when the universe was very young (approximately 5 percent of its current age), of planets not in our own solar system, and with the tantalizing evidence that the conditions for life may have existed within our solar system on planets or moons outside of the earth system, the past year has seen an explosion of interest in astronomy. In particular, a new era of exploration and understanding seems imminent, where the existence for the conditions of life will be connected to the origin of galaxies, stars and planets within the Universe. Who knows where this quest for knowledge will take us?
Author
Next Generation Space Telescope Project; Spaceborne Telescopes; Astronomical Observatories; Technology Utilization

20010020863 Oregon Univ., Dept. of Physics, Eugene, OR USA
Optical Field Reconstruction Using Phase-Space Tomography ***Final Report, 30 Sep. 1994 - 30 Sep. 1998***
Raymer, M. G., Oregon Univ., USA; Dec. 21, 1999; 3p; In English
Contract(s)/Grant(s): DAAH04-94-G-0416
Report No.(s): AD-A379215; ARO-32887.3-PH; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

Measurement of light transport in a random, multiple scattering medium can provide details about the spatial structure of inhomogeneities within the medium. Progress made includes construction of a new system for making measurements of the complex, two-point optical field correlation function for continuous-wave laser light after propagating through a random-dielectric medium, in particular polystyrenespheres in water. The new system is based on a Sagnac shearing interferometer, with a CCD camera and computer processor. Several important design issues, dealing with resolution and throughput were solved by use of optical design software. Quantitative agreement has been found between measurements and theory, providing new insights into the behavior of light as it travels in random media.
DTIC
Tomography; Optical Measurement; Optical Equipment; Image Reconstruction; Light (Visible Radiation)

20010021170 NASA Marshall Space Flight Center, Huntsville, AL USA
Overview of Mirror Technology Development for Large Lightweight Space-Based Optical Systems
Smith, W. Scott, NASA Marshall Space Flight Center, USA; Stahl, H. P., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; Intelligent Systems and Advanced Manufacturing, 5-8 Nov. 2000, Boston, MA, USA; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Space Optics Manufacturing Technology Center of Marshall Space Flight Center is involved in the development of lightweight optics for spacebased'systems. The NGST and other future NASA programs require large aperture space-based instruments. This paper reviews the technologies under development for NGST including discussions of the environmental testing of candidate segment for the NGST primary mirror.
Author
Mirrors; Apertures; Satellite-Borne Instruments; Optical Equipment

20010021173 NASA Marshall Space Flight Center, Huntsville, AL USA
Electro-Formed Mirrors for Both X-Ray and Visible Astronomy
Ritter, J., NASA Marshall Space Flight Center, USA; Smith, W. Scott, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; Intelligent Systems and Advanced Manufacturing, 5-8 Nov. 2000, Boston, MA, USA; Sponsored by International Society for Optical Engineering, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

The Space Optics Manufacturing Technology Center of NASA's Marshall Space Flight Center is involved in the development of nickel and nickel alloy electroformed mirrors for rapid production of space-based optical systems. The current state of the process is discussed- for both cylindrical x-ray mirrors and normal incidence mirrors for visible and infrared applications.
Author
Electroforming; Nickel Alloys; Mirrors

20010021260 Helsinki Univ. of Technology, Dept. of Engineering Physics and Mathematics, Espoo, Finland
Studies of Crystal and Planar Optics
Ayras, Pekka, Helsinki Univ. of Technology, Finland; 1999; 114p; In English; Supported in part by the Ministry of Trade and Industry, the Jenny and Antti Wihuri Foundation, the Finnish Cultural Foundation, and the Vilho, Yrjo and Kalle Vaisala Foundation
Report No.(s): PB2000-102630; ISBN 951-22-4694-5; No Copyright; Avail: National Technical Information Service (NTIS)

In this thesis the polarization properties and the propagation of light are studied in crystal and planar optic applications. In this work, crystal optics is understood as the study of the bulk properties of crystalline materials. Planar optics is interpreted broadly as the study of optic components that are in a plane, regardless of the direction of propagation of the light.Hence, integrated optics and micro-optical components are included in this definition. First, a polarimetric method for studying crystals is discussed. Polarization plays an important role in integrated optics as well. There the polarization dependency may be a disadvantage or an advantage. Next, both of these aspects are discussed in this work in the optic communications and sensor points of view. Finally, propagation of light is studied in selected micro-optical structures.
Derived from text
Crystal Optics; Integrated Optics; Research; Optical Properties

20010021627 Sandia National Labs., Albuquerque, NM USA
What Makes a Beam Shaping Problem Difficult
Romero, L.; Dickey, F. M.; Jul. 19, 2000; 13p; In English
Report No.(s): DE00-760055; SAND2000-0078C; No Copyright; Avail: Department of Energy Information Bridge

The authors have discussed the three factors that they believe are the most important in determining the difficulty of a beam shaping problem: scaling, smoothness, and coherence. The arguments have been almost completely based on considering how these factors influence beam shaping lenses that were designed using geometrical optics. However, they believe that these factors control the difficulty of beam shaping problems even if one does not base ones design strategy on geometrical optics. For example, they have shown that a lens designed using geometrical optics will not work well unless (beta) is large. However, they have also shown that if (beta) is small the uncertainty principle shows that it is impossible to do a good job of beam shaping no matter how one designs ones lens.
NTIS
Geometrical Optics; Beamforming

75
PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20010020019 Princeton Plasma Physics Lab., Princeton, NJ USA
2D Numerical Simulation of the Resistive Reconnection Layer
Uzdensky, D. A.; Kulsrud, R. M.; Jul. 21, 2000; 35p; In English
Report No.(s): DE00-758723; PPPL-3478; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper the authors present a two-dimensional numerical simulation of a reconnection current layer in incompressible resistive magnetohydrodynamics with uniform resistivity in the limit of very large Lundquist numbers. They use realistic boundary conditions derived consistently from the outside magnetic field, and they also take into account the effect of the back-pressure from flow into the separatrix region. They find that within a few Alfven times the system reaches a steady state consistent with the Sweet-Parker model, even if the initial state is Petschek-like.
NTIS
Two Dimensional Models; Mathematical Models; Simulation; Plasmas (Physics); Magnetohydrodynamic Flow

20010020020 Princeton Plasma Physics Lab., Princeton, NJ USA
Electron Bernstein Wave Electron Temperature Profile Diagnostic
Taylor, G.; Efthimion, P.; Jones, B.; Munsat, T.; Spaleta, J.; Jul. 20, 2000; 30p; In English
Report No.(s): DE00-758660; PPPL-3476; No Copyright; Avail: Department of Energy Information Bridge

Electron cyclotron emission (ECE) has been employed as a standard electron temperature profile diagnostic on many tokamaks and stellarators, but most magnetically confined plasma devices cannot take advantage of standard ECE diagnostics to measure temperature. They are either overdense, operating at high density relative to the magnetic field (e.g. where the plasma frequency is much greater than the electron cyclotron frequency, as in a spherical torus) or they have insufficient density and temperature to reach the blackbody condition. Electron Bernstein waves (EBWs) are electrostatic waves that can propagate in overdense plasmas and have a high optical thickness at the electron cyclotron resonance layers, as a result of their large perpendicular wavenumber. This paper reports on measurements of EBW emission on the CDX-U spherical torus, where B(sub o) (approximately) 2 kG, <n(sub e)> (approximately)10(sup 13) cm(sup (minus)3) and T(sub e) (approx) to 10 -- 200 eV. Results are presented for electromagnetic measurements of EBW emission, mode-converted near the plasma edge. The EBW emission was absolutely calibrated and compared to the electron temperature profile measured by a multi-point Thomson scattering diagnostic. Depending on the plasma conditions, the mode converted EBW radiation temperature was found to be less than or equal to T(sub e) and the emission source was determined to be radially localized at the electron cyclotron resonance layer. A Langmuir triple probe and a 140 GHz interferometer were employed to measure changes in edge density profile in the vicinity of the upper hybrid resonance, where the mode conversion of the EBWs is expected to occur. Initial results suggest EBW emission and EBW heating are viable concepts for overdense plasmas.
NTIS
Bernstein Energy Principle; Electron Energy; Plasma Diagnostics; Cyclotron Radiation; Temperature Profiles; Electrostatic Waves

20010020205 NASA Marshall Space Flight Center, Huntsville, AL USA
ISS and Space Environment Interactions in Event of Plasma Contactor Failure
Carruth, M. R., Jr., NASA Marshall Space Flight Center, USA; [2000]; 3p; In English; 7th; Spacecraft Charging Technology, 23 - 27 Apr. 2001, Noordwijk, Netherlands; No Copyright; Avail: Issuing Activity; Abstract Only

The International Space Station (ISS), illustrated in Figure 1, will be the largest, highest power spacecraft placed in orbit. Because of this the design of the electrical power system diverged markedly from previous systems. The solar arrays will operate at 160 V and the power distribution voltage will be 120 V. The structure is grounded to the negative side of the solar arrays so under the right circumstances it is possible to drive the ISS potential very negative. A plasma contactor has been added to the ISS to provide control of the ISS structure potential relative to the ambient plasma. The ISS requirement is that the ISS structure not be greater than 40 V positive or negative of local plasma. What are the ramifications of operating large structures with such high voltage power systems? The application of a plasma contactor on ISS controls the potential between the structure and the local plasma, preventing degrading effects. It is conceivable that there can be situations where the plasma contactor might be non-functional. This might be due to lack of power, the need to turn it off during some of the build-up sequences, the loss of functionality for both plasma contactors before a replacement can be installed, and similar circumstances. A study was undertaken to understand

how important it is to have the contactor functioning and how long it might be off before unacceptable degradation to ISS could occur.
Author
Spacecraft Charging; System Generated Electromagnetic Pulses; Electric Fields; Electric Current; Solar Arrays

20010020622
SHOW. A program for the integrated analysis of the data produced in a nuclear fusion experimental device
Bracco, G.; Tudisco, O.; Mar. 31, 1998; 106p; In English
Report No.(s): DE99-712627; ENEA-ERG-FUS-97-19; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The report describes the program SHOW, an application devoted to the integrated analysis of the data produced in nuclear fusion experimental devices. The program is currently used for the analysis of the FTU data and a version is also available at JET. The code is written in FORTRAN 77, runs on IBM mainframes under MVS operating system and makes use of the GDDM graphical package. The program, that operates both in batch and interactive modes, permits to perform a graphical analysis of the data collected in the experimental databases. The report contains as appendixes the detailed description of all the program options together with a short illustration of the FTU databases.
NTIS
Nuclear Fusion; Nuclear Reactors

20010020634
Heat flux driven ion turbulence
Garbet, X.; Waltz, R. E.; Jan. 31, 1998; 33p; In English
Report No.(s): DE99-609076; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This work is an analysis of an ion turbulence in a tokamak in the case where the thermal flux is fixed and the temperature profile is allowed to fluctuate. The system exhibits some features of Self-Organized Critical systems. In particular, avalanches are observed. Also the frequency spectrum of the thermal flux exhibits a structure similar to the one of a sand pile automaton, including a 1/f behavior. However, the time average temperature profile is found to be supercritical, i.e. the temperature gradient stays above the critical value. Moreover, the heat diffusivity is lower for a turbulence calculated at fixed flux than a fixed temperature gradient, with the same time average temperature. This behavior is attributed to a stabilizing effect of avalanches.
NTIS
Heat Flux; Turbulence; Plasma Physics

20010020635
Particle flux and temperature dependence of carbon impurity production from an inertially-cooled limiter in tore supra
DeMichelis, C.; Monier-Garbet, P.; Guilhem, D.; Tobin, S. J.; Hogan, J. T.; Jan. 31, 1998; 27p; In English
Report No.(s): DE99-609075; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A visible endoscope system and an infrared camera system have been used to study the flux of carbon from an inertially-cooled graphite limiter in Tore Supra. From the variation in the carbon flux with plasma parameters, new data have been obtained describing the dependence of radiation enhanced sublimation (RES) and chemical sputtering on incident ion flux. Other characteristics of RES under plasma operation conditions have also been studied. The dependence of RES on incident deuterium particle flux density is found to be in reasonable agreement with the expected particle flux scaling over a range of particle fluxes varying by a factor of approx. 25, extending the present scaling to higher flux density values. Chemical sputtering has been observed, but only in regions of the limiter with low incident deuterium fluxes. Values inferred for the chemical sputtering yield are similar to those measured with a temperature controlled test limiter in Textor.
NTIS
Particle Flux Density; Temperature Dependence; Impurities; Plasma Physics

20010020638
New scheme to treat the numerical instability for electromagnetic particle simulations
Assous, F.; Degond, P.; Segre, J.; Degond, P.; Oct. 31, 1997; 27p; In French; In English
Report No.(s): DE99-609072; CEA-N-2824; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The aim of this paper is to present a new explicit time scheme for electromagnetic particle simulations. The main property of this new scheme, which depends on a parameter, is to reduce and in some cases to suppress numerical instabilities that can

appear in this context, and are widely described in the literature. Other numerical properties are also investigated, and a numerical example is finally given to illustrate our purpose. This scheme is expected to be useful in the field of plasma modeling.
NTIS
Numerical Stability; Numerical Analysis

20010020791
Preliminary project of s Thomson scattering system for the ETE tokamak
Berni, L. A.; Dec. 31, 1997; 36p; In Portuguese; In English
Report No.(s): DE99-605435; INPE-6377-PRP/204; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report presents the preliminary project of the injection and laser light block system for the Thomson (ET) scattering diagnostic to be implanted at the ETE spheric tokamak of the Instituto Nacional de Pesquisas Espaciais (INPE/LAP). Also, a scanning system for the optics of scattered light.
NTIS
Thomson Scattering; Tokamak Devices; Lasers

20010021029
Parallel pic plasma simulation through particle decomposition techniques
Briguglio, S.; Vlad, G.; Di Martino, B.; Feb. 28, 1998; 30p; In English
Report No.(s): DE99-712632; ENEA-ERG-FUS-97-16; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Particle-in-cell (PIC) codes are among the major candidates to yield a satisfactory description of the detail of kinetic effects, such as the resonant wave-particle interaction, relevant in determining the transport mechanism in magnetically confined plasmas. A significant improvement of the simulation performance of such codes can be expected from parallelization, e.g., by distributing the particle population among several parallel processors. Parallelization of a hybrid magnetohydrodynamic-gyrokinetic code has been accomplished within the High Performance FORTRAN (HPF) framework, and tested on the IBM SP2 parallel system, using a 'particle decomposition' technique. The adopted technique requires a moderate effort in porting the code in parallel form and results in intrinsic load balancing and modest inter processor communication. The performance tests obtained confirm the hypothesis of high effectiveness of the strategy, if targeted towards moderately parallel architectures. Optimal use of resources is also discussed with reference to a specific physics problem.
NTIS
Particle In Cell Technique; Plasma Control; Plasma Diffusion; Plasmas (Physics); Wave-Particle Interactions; Simulation

20010021107
Influence of plasma temperature on the formation of wake waves
Amatuni, A.; Ehlbakyan, S. S.; Sekhposyan, E.; Dec. 31, 1991; 19p; In Russian; In English
Report No.(s): DE99-604243; EFI-1316-11-91; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Using the relativistically invariant form of Vlasov equation, an equation of motion of charged relativistic electron liquid is obtained in a hydrodynamical approximation for non zero temperature of the plasma. It is shown that the allowance for thermal motion at the calculation of wake waves of the relativistic bunch in plasma leads to insignificant corrections to the characteristics of wake waves for temperatures achievable under laboratory conditions.
NTIS
Plasma Temperature; Plasma Physics; Temperature Effects

20010021143 Princeton Plasma Physics Lab., Princeton, NJ USA
Visual Tritium Imaging of In-Vessel Surfaces
Jun. 26, 2000; 9p; In English
Report No.(s): DE00-757065; PPPL-3458; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
An imaging detector has been developed for the purpose of providing a nondestructive, real time method of determining tritium concentrations on the surface of internal TFTR vacuum vessel components. The detector employs a green phosphor screen (P31, zinc sulfide: copper) with a wave length peak of 530 nm, a charge-coupled device (CCD) camera linked to a computer, and a detection chamber for inserting components recovered from the vacuum vessel. This detector is capable of determining tritium

concentrations on the surfaces. The detector provides a method of imaging tritium deposition on the surfaces in a fairly rapid fashion.
NTIS
Imaging Techniques; Tokamak Devices; Tritium; Pressure Vessels

20010021144 Princeton Plasma Physics Lab., Princeton, NJ USA
Fast Ion Loss Diagnostic Plans for NSTX
Bell, R.; Kugel, H.; Jun. 13, 2000; 15p; In English
Report No.(s): DE00-757064; PPPL-3452; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The prompt loss of neutral beam ions from the National Spherical Torus Experiment (NSTX) is expected to be between 12% and 42% of the total 5 MW of beam power. There may, in addition, be losses of fast ions arising from high harmonic fast wave (HHFW) heating. Most of the lost ions will strike the HHFW antenna or the neutral beam dump. to measure these losses in the 2000 experimental campaign, thermocouples in the antenna, several infrared camera views, and a Faraday cup lost ion probe will be employed. The probe will measure loss of fast ions with E>1 keV at three radial locations, giving the scrape-off length of the fast ions.
NTIS
Ions; Tokamak Devices; Plasma Physics

20010021145 Princeton Plasma Physics Lab., Princeton, NJ USA
Broadening and Shifting of the Methanol 119 m Gain Line of Linear and Circular Polarization by Collision with Chiral Molecules
Bakos, J. S.; Jun. 21, 2000; 14p; In English
Report No.(s): DE00-756995; PPPL-3457; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Evidence of circular dichroism has been observed in the spectral properties of a gas of left-right symmetric molecules. This dichroism comes about as the result of collisions of the symmetric molecules with left-right asymmetric molecules introduced as a buffer gas. In this sense, the dichroism can be said to have been transferred from the chiral buffer molecules to the symmetric, non-chiral molecules of the background vapor. This transferred dichroism appears as broadening in the gain line of the symmetric molecule which is asymmetric with respect to the right or left handedness of a circularly polarized probe. The broadening of the 119 m line of the methanol molecule was observed using infrared-far infrared double resonance spectroscopy.
NTIS
Collisions; Dichroism; Methyl Alcohol; Molecular Collisions; Symmetry

20010021146 Princeton Plasma Physics Lab., Princeton, NJ USA
Rotation and Particle Loss in Tore Supra
Garbet, X.; Bourdelle, C.; Basiuk, V.; Jun. 13, 2000; 7p; In English
Report No.(s): DE00-756909; PPPL-3460; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Although plasma heating with ICRF imparts negligible angular momentum to a tokamak plasma, the high energy particles give significant torque to the plasma through diamagnetic effects. This effect has been directly modeled through guiding center simulations. It is found that heating in Tore Supra, with the location of the resonance surface on the high field side of the magnetic axis, can produce negative central rotation of up to 40 km/sec (1, 2). Particle loss also contributes to negative rotation, but this is not the dominant effect in most discharges. In this work we examine the effect of collisions and strong plasma rotation on the loss of high energy particles.
NTIS
Particle Energy; Plasma Heating; Radio Frequency Heating; Particles

20010021147 Princeton Plasma Physics Lab., Princeton, NJ USA
Physics Results from the National Spherical Torus Experiment
Bell, M. G.; Jun. 13, 2000; 7p; In English
Report No.(s): DE00-756898; PPPL-3459; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The National Spherical Torus Experiment (NSTX) at the Princeton Plasma Physics Laboratory is designed for studying toroidal plasma confinement at very low aspect-ratio, A=R/a = 0.85m/0.68m; 1.25, with cross-section elongation up to 2.2 and triangularity up to 0.5, for plasma currents up to 1 MA and vacuum toroidal magnetic fields up to 0.6 T on axis. Conducting plates are installed close to the plasma on the outboard side to stabilize kink modes. This should permit operation with toroidal-beta approaching 40% (1). The plasmas will be heated by up to 6 MW High-Harmonic Fast Waves (HHFW) at a frequency 30 MHz

and by 5 MW of 80 keV deuterium Neutral Beam Injection. Inductive plasma startup can be supplemented by the process of Coaxial Helicity Injection (CHI).
NTIS
Plasma Control; Toroidal Plasmas; Tokamak Devices; Research Facilities

20010021167 NASA Marshall Space Flight Center, Huntsville, AL USA
Gasdynamic Mirror Fusion Propulsion Experiment
Emrich, Bill, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 42nd; Plasma Propulsion 5: Fusion Plasma Propulsion, 23-27 Oct. 2000, Quebec, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

A gasdynamic mirror (GDM) fusion propulsion experiment is currently being constructed at the NASA Marshall Space Flight Center (MSFC) to test the feasibility of this particular type of fusion device. Because of the open magnetic field line configuration of mirror fusion devices, they are particularly well suited for propulsion system applications since they allow for the easy ejection of thrust producing plasma. Currently, the MSFC GDM is constructed in three segments. The vacuum chamber mirror segment, the plasma injector mirror segment, and the main plasma chamber segment. Enough magnets are currently available to construct up to three main plasma chamber segments. The mirror segments are also segmented such that they can be expanded to accommodate new end plugging strategies with out requiring the disassembly of the entire mirror segment. The plasma for the experiment is generated in a microwave cavity located between the main magnets and the mirror magnets. Ion heating is accomplished through ambipolar diffusion. The objective of the experiment is to investigate the stability characteristics of the gasdynamic mirror and to map a region of parameter space within which the plasma can be confined in a stable steady state configuration. The mirror ratio, plasma density, and plasma ”b” will be varied over a range of values and measurements subsequently taken to determine the degree of plasma stability.
Author
Gas Dynamics; Mirror Fusion; Experimentation; Flight Tests; Fusion Propulsion; Magnetic Mirrors; Magnetohydrodynamic Stability

20010021218 NASA Marshall Space Flight Center, Huntsville, AL USA
Interfacial Stability of Spherically Converging Plasma Jets for Magnetized Target Fusion
Thio, Y. C. Francis, NASA Marshall Space Flight Center, USA; Cassibry, Jason, NASA Marshall Space Flight Center, USA; Wu, S. T., NASA Marshall Space Flight Center, USA; Eskridge, Richard, NASA Marshall Space Flight Center, USA; Smith, James, NASA Marshall Space Flight Center, USA; Lee, Michael, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 42nd; Plasma Physics, 23-27 Oct. 2000, Quebec, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

A fusion propulsion scheme has been proposed that makes use of the merging of a spherical distribution of plasma jets to dynamically form a gaseous liner to implode a magnetized target to produce the fusion reaction. In this paper, a study is made of the interfacial stability of the interaction of these jets. Specifically, the Orr-Sommerfeld equation is integrated to obtain the growth rate of a perturbation to the primary flow at the interface between the colliding jets. The results lead to an estimate on the tolerances on the relative flow velocities of the merging plasma jets to form a stable, imploding liner. The results show that the maximum temporal growth rate of the perturbed flow at the jet interface is very small in comparison with the time to full compression of the liner. These data suggest that, as far as the stability of the interface between the merging jets is concerned, the formation of the gaseous liner can withstand velocity variation of the order of 10% between the neighboring jets over the density and temperature ranges investigated.
Author
Plasma Jets; Interface Stability; Spherical Plasmas; Stability

20010021221 NASA Marshall Space Flight Center, Huntsville, AL USA
Magnetosheath Flow Anomalies in 3-D
Vaisberg, O. L., NASA Goddard Space Flight Center, USA; Burch, J. L., Southwest Research Inst., USA; Smirnov, V. N., Institute of Space Research, USSR; Avanov, L. A., Institute of Space Research, USSR; Moore, T. E., NASA Goddard Space Flight Center, USA; Waite, J. H., Jr., Southwest Research Inst., USA; Skalsky, A. A., Institute of Space Research, USSR; Borodkova, N. L., Institute of Space Research, USSR; Coffey, V. N., NASA Marshall Space Flight Center, USA; Gallagher, D. L., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 17 Dec. 2000, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Measurements of the plasma and magnetic field with high temporal resolution on the Interball Tail probe reveal many flow anomalies in the magnetosheath. They are usually seen as flow direction and number density variations, accompanied by magnetic field discontinuities. Large flow anomalies with number density variations of factor of 2 or more and velocity variations of 100

km/s or more are seen with periodicity of about I per hour. The cases of flow anomalies following in succession are also observed, and suggest their decay while propagating through the magnetosheath. Some magnetospheric disturbances observed in the outer magnetosphere after the satellite has crossed the magnetopause on the inbound orbit suggest their association with magnetosheath flow anomalies observed in the magnetosheath prior to magnetopause crossing.
Author
Magnetosheath; Magnetopause; Plasmas (Physics); Magnetic Fields; Anomalies; Three Dimensional Models

20010021226 NASA Marshall Space Flight Center, Huntsville, AL USA
Modeling the Compression of Merged Compact Toroids by Multiple Plasma Jets
Thio, Y. C. Francis, NASA Marshall Space Flight Center, USA; Knapp, Charles E., Los Alamos National Lab., USA; Kirkpatrick, Ron, Los Alamos National Lab., USA; [2000]; 1p; In English; 42nd; Plasma Physics, 23-27 Oct. 2000, Quebec, Canada; No Copyright; Avail: Issuing Activity; Abstract Only

A fusion propulsion scheme has been proposed that makes use of the merging of a spherical distribution of plasma jets to dynamically form a gaseous liner. The gaseous liner is used to implode a magnetized target to produce the fusion reaction in a standoff manner. In this paper, the merging of the plasma jets to form the gaseous liner is investigated numerically. The Los Alamos SPHINX code, based on the smoothed particle hydrodynamics method is used to model the interaction of the jets. 2-D and 3-D simulations have been performed to study the characteristics of the resulting flow when these jets collide. The results show that the jets merge to form a plasma liner that converge radially which may be used to compress the central plasma to fusion conditions. Details of the computational model and the SPH numerical methods will be presented together with the numerical results.
Author
Plasma Jets; Toroids; Mathematical Models; Fusion Propulsion; Spherical Plasmas

20010021248 Princeton Plasma Physics Lab., Princeton, NJ USA
Visible Imaging of Edge Turbulence in NSTX
Zweben, S.; Maqueda, R.; Hill, K.; Johnson, D.; Kaye, S.; Jun. 21, 2000; 8p; In English
Report No.(s): DE00-757605; PPPL-3464; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Edge plasma turbulence in tokamaks and stellarators is believed to cause the radial heat and particle flux across the separatrix and into the scrape-off-layers of these devices. This paper describes initial measurements of 2-D space-time structure of the edge density turbulence made using a visible imaging diagnostic in the National Spherical Torus Experiment (NSTX). The structure of the edge turbulence is most clearly visible using a method of 'gas puff imaging' to locally illuminate the edge density turbulence.
NTIS
Imaging Techniques; Plasma Turbulence; Tokamak Devices; Plasmas (Physics)

20010021249 Princeton Plasma Physics Lab., Princeton, NJ USA
Effect of Plasma Rotation on Sawtooth Stabilization by Beam Ions
Budny, R.; Jun. 23, 2000; 7p; In English
Report No.(s): DE00-757604; PPPL-3463; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The sawtooth period in JET ELM-free H-Mode plasmas is increasing with Neutral Beam Injection (NBI) power. For injected power PNBI 12MW no large sawtooth crash is observed during the ELM-free period. However, as the edge stability is improved and external kink modes and ELMs are delayed, a possible sawtooth crash at a high plasma beta becomes a concern. In JET DT experiments, delaying sawteeth was found to be crucial in the quest for high fusion power. Fast particles are known to provide stabilizing effect on sawteeth, however, sawtooth stabilization by NBI ions is not clearly understood, since NBI ions are usually not 'fast' enough to stabilize the m/n = 1/1 internal kink mode which is believed to cause the crash. In order to understand the observed sawteeth stabilization in tokamak experiments with NBI heating, the internal kink m/n = 1/1 mode stability of JET plasmas was modeled using the NOVA-K code(3), which is also benchmarked with the nonperturbative version of NOVA(4) and the M3D code(5). Comparison of m/n = 1/1 mode stabilization by NBI ions in JET and TFTR and application of the nonlinear w*stabilization criteria(6) is given.
NTIS
Ions; Neutral Beams; Plasmas (Physics); Stabilization; Plasma Diagnostics

20010021250 Princeton Plasma Physics Lab., Princeton, NJ USA
Studies of Tritiated Co-deposited Layers in TFTR
Skinner, C. H.; Gentile, C. A.; Ascione, G.; Carpe, A.; Causey, R. A.; Jun. 28, 2000; 18p; In English
Report No.(s): DE00-757602; PPPL-3462; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Plasma facing components in TFTR contain an important record of plasma wall interactions in reactor grade DT plasmas. Tiles, flakes, wall coupons, a stainless steel shutter and dust samples have been retrieved from the TFTR vessel for analysis. Selected samples have been baked to release tritium and assay the tritium content. The in-vessel tritium inventory is estimated to be 0.56 g and is consistent with the in-vessel tritium inventory derived from the difference between tritium fueling and tritium exhaust. The distribution of tritium on the limiter and vessel wall showed complex patterns of co-deposition. Relatively high concentrations of tritium were found at the top and bottom of the bumper limiter, as predicted by earlier BBQ modeling.
NTIS
Fusion Reactors; Plasmas (Physics); Tokamak Devices

20010021251 Princeton Plasma Physics Lab., Princeton, NJ USA
Plasma Turbulence Imaging Using High-Power Laser Thomson Scattering
Zweben, S. J.; Caird, J.; Davis, W.; Johnson, D. W.; LeBlanc, B. P.; Jun. 08, 2000; 22p; In English
Report No.(s): DE00-757323; PPPL-3461; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The 2-D structure of plasma density turbulence in a magnetically confined plasma can potentially be measured using a Thomson scattering system made from components of the Nova laser of LLNL. For a plasma such as NSTX at PPPL, the laser would form an =10 cm wide plane sheet beam passing vertically through the chamber across the magnetic field. The scattered light would be imaged by a CCD camera viewing along the direction of the magnetic field. The laser energy required to make 2-D images of density turbulence is in the range 1-3 kJ, which can potentially be obtained from a set of frequency-doubled Nd:Glass amplifiers with diameters in the range of 208-315 mm. A laser pulse width of *100 nsec would be short enough to capture the highest spatial frequency components of the expected density fluctuations.
NTIS
Plasma Density; Plasma Turbulence; Plasmas (Physics); Thomson Scattering

20010021252 Princeton Plasma Physics Lab., Princeton, NJ USA
Operational Limits in the National Spherical Torus Experiment
Kaye, S. M.; Gates, D.; Maingi, R.; Jun. 12, 2000; 7p; In English
Report No.(s): DE00-757304; PPPL-3454; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The National Spherical Torus Experiment (NSTX) is a proof-of-principle scale device whose mission is to establish the physics basis of low aspect configurations most notably in the areas of plasma stability, transport and non-inductive current drive. The first series of physics experiments was conducted during the period from Sept. 1999 through Jan. 2000. Among the first experiments was a study to map out and characterize the operational density and q-limits. Density limits have typically been associated with enhanced radiated power due to overfuelling or impurity influx, although ion neoclassical transport may impose a density limit at very high densities in ohmic, gas-fueled plasmas. q-limits have typically been manifestations of destabilization of m=2/n=1 kink or tearing modes that lead to a sudden discharge termination.
NTIS
Magnetohydrodynamic Stability; Toruses; Tokamak Devices

20010021320 NASA Marshall Space Flight Center, Huntsville, AL USA
Interfacial Stability of Converging Plasma Jets for Magnetized Target Fusion
Cassibry, J. T., Alabama Univ., USA; Thio, Y. C. F., NASA Marshall Space Flight Center, USA; Wu, S. T., Alabama Univ., USA; [2001]; 1p; In English; Space Technologies Applications, 11-14 Feb. 2001, Albuquerque, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The merging of a spherical distribution of plasma jets to dynamically form a gaseous liner has been proposed for use in magnetized target fusion propulsion. In this paper, a study is made of the interfacial stability of the interaction of these jets. Specifically, the Orr-Sommerfeld equation is integrated to obtain the growth rate of a perturbation to the primary flow at the interface between the colliding jets. The analysis lead to an estimate on the tolerances on the relative flow velocities of the merging plasma jets to form a stable, imploding liner. The results show that during the merging of the jets to form a liner and before contact with the target plasma the growth of the perturbed flow at the jet interface is not likely to destabilize the liner. These data suggest that, as far as the stability of the interface between the merging jets is concerned, the formation of liner can withstand velocity variation up to 50% between the neighboring jets over the density and temperature ranges investigated.
Author
Plasma Jets; Interface Stability; Fusion Propulsion; Magnetization; Plasmas (Physics)

20010021361 Osaka City Univ., Faculty of Engineering, Japan

Plasma Electron Temperature Estimation Using Line Intensity Ratio of Low Ionized Oxygen Ions

Mimura, Mikio, Osaka City Univ., Japan; Tsuboi, Hiroshi, Osaka City Univ., Japan; Tsuboi, Hiroshi, National Inst. for Fusion Science, Japan; Namba, Shinichi, National Inst. for Fusion Science, Japan; Sato, Kuninori, National Inst. for Fusion Science, Japan; Memoirs of the Faculty of Engineering, Osaka City University; December 2000; ISSN 0078-6659; Volume 41, pp. 73-78; In English; Copyright; Avail: Issuing Activity

For the optical measurement of electron temperature of stationary plasma, a line intensity ratio method that utilizes the lines from low ionized oxygen ions is tested. This method is applicable to the low electron temperature between 4 eV and 11 eV, which can not be measured by the usual intensity ratio method. The line intensity of lower ionized oxygen ions, OII, OIII and OIV from TPD-II plasma are measured by a VUV monochromator. Then a calculation of the corresponding line intensity is performed using the rate equations. by comparing their intensity ratios, the electron temperature of the plasma is estimated. The obtained electron temperature agrees well to the result of a Thomson scattering measurement.

Author

Optical Measurement; Plasma Temperature; Temperature Measurement; Electron Energy

20010021510 Los Alamos National Lab., NM USA

Large Format X-ray Imager

Oertel, J. A.; Archuleta, T.; Schrank, L.; Jun. 2000; 20p; In English; Color illustrations reproduced in black and white. Presented at Topical Conference on High-Temperature Plasma Diagnostics, (13th), Tucson, AZ, June 18-22, 2000; Original contains color illustrations

Report No.(s): PB2001-102965; LU-UR-00-2627; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We introduce a new Large Format X-ray Imaging Camera (LFC) for the Los Alamos National laboratory (LANL) Inertial Confinement Fusion/Radiation Physics (ICF/RP) program. This instrument is intended as a prototype for use at the National Ignition Facility (NIF), but is capable of operating at LANL's Trident and the University of Rochesters Omega laser systems. The LFC is based upon similar x-ray camera architecture and is currently in the final design stages. It is designed around 3 large (35-mm x 105-mm) microchannel plate (MCP) detectors primarily to give a larger field of view, but also for greater temporal coverage and higher magnification. The camera is designed to have 30 data channels, six 13-mm wide microstrips, continuous temporal coverage of 4.2-ns, adjustable electrical gate width and variable gain on each microstrip and magnifications up to 20x. In the process of designing LFC we scrutinized every element of gated x-ray imaging and designed optimization experiments for many of these elements. We found that for a given taper length, the Klopfenstein impedance taper is optimum in that the reflection coefficient is minimized over the pass-band. Based on the results of intensity and resolution as a function of phosphor areal density studies, we routinely deposit 0.6 mg/cm2 of P-11 phosphor on all fiberoptic faceplates.

NTIS

Cameras; X Ray Imagery; Inertial Confinement Fusion; Plasmas (Physics)

20010021559 Environmental Elements Corp., Baltimore, MD USA

Decontamination and Sterilization of Surfaces by Means of a One Atmosphere Uniform Glow Discharge Plasma ***Final Report, 20 Aug. 1998 - 30 Sep. 2000***

Helfritch, Dennis J.; Feldman, Paul L.; Roth, J. R.; Montie, Thomas C.; Kelly-Wintenberg, Kimberly; Oct. 2000; 49p; In English Contract(s)/Grant(s): F49620-98-C-0069

Report No.(s): AD-A385202; AFOSR-431018; AFRL-SR-BL-TR-00-0683; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Decontamination of surfaces that have been exposed to biological agents must be accomplished quickly under battlefield conditions. Current decontamination processes utilize corrosive solutions. which require careful handling and can damage the equipment that must be treated. A simple. fast-acting. and safe method for equipment decontamination would minimize equipment downtime and minimize the number of personnel needed. It has been demonstrated that exposure of microorganisms to gas discharge plasma reaction products leads to their destruction. In particular. an air stream. treated by the One Atmosphere Uniform Glow Discharge Plasma (OAUGDP). has been shown to destroy microorganisms in a time frame of tens of seconds. Simulants of biological agents coating surfaces similar to military equipment were exposed to the OAUGDP reactor under various operating parameters. Exposure time was the principal variable. The performance of the OAUGDP reactor applied to several types of microorganism was evaluated. All microorganisms used were destroyed within seconds to minutes of plasma exposure. The results indi-

cate that the OAUGDP can be successfully used for military biological decontamination. The OAUGDP reactor is especially useful for the decontamination of sensitive equipment. which would be harmed by chemical washes.
DTIC
Decontamination; Sterilization; Surface Finishing; Reaction Products; Coating

20010021610 Department of Energy, Office of Fusion Energy Science, Washington, DC USA
International Sherwood Fusion Theory Conference for 1998
1998; 192p; In English, 23-25 Mar. 1998, Atlanta, GA, USA
Report No.(s): DE98-004704; No Copyright; Avail: Department of Energy Information Bridge

This book is a guide to the 1998 International Sherwood Fusion Theory Conference. It consists largely of abstracts of the oral and poster presentations that were to be made, and gives some general information about the conference and its schedule.
NTIS
Conferences; Schedules; Thermonuclear Reactions; Fusion; Plasma Physics

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SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

20010019994 NASA Marshall Space Flight Center, Huntsville, AL USA
Detached Bridgman Growth of Germanium and Germanium-Silicon Alloy Crystals
Szofran, F. R., NASA Marshall Space Flight Center, USA; Volz, M. P., NASA Marshall Space Flight Center, USA; Schweizer, M., Universities Space Research Association, USA; Kaiser, N., Freiburg Univ., Germany; Cobb, S. D., NASA Marshall Space Flight Center, USA; Motakef, S., Cape Simulations, Inc., USA; Vujisic, L. J., Cape Simulations, Inc., USA; Croell, A., Freiburg Univ., Germany; Dold, P., Freiburg Univ., Germany; [2001]; 1p; In English; 52nd; International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

Earth based experiments on the science of detached crystal growth are being conducted on germanium and germanium-silicon alloys (2at% Si average composition) in preparation for a series of experiments aboard the International Space Station (ISS) to differentiate among proposed mechanisms contributing to detachment. Sessile drop measurements were first carried out for a large number of substrates made of potential ampoule materials to determine the contact angles and the surface tension as a function of temperature and composition. The process atmosphere and duration of the experiment (for some cases) were also found to have significant influence on the wetting angle. Growth experiments have used pyrolytic boron nitride (pBN) and fused silica ampoules with the majority of the detached results occurring predictably in the pBN. The contact angles were 173 deg (Ge) and 165 deg (GeSi) for pBN. For fused silica, the contact angle decreases to an equilibrium value with duration of measurement ranging from 150 to 117 deg (Ge), 129 to 100 deg (GeSi). Forming gas (Ar + 2% H2) and vacuum have been used in the growth ampoules. With gas in the ampoule, a variation of the temperature profile during growth has been used to control the pressure difference between the top of the melt and the volume below the melt caused by detachment of the growing crystal. The stability of detachment has been modeled and substantial insight has been gained into the reasons that detachment has most often been observed in reduced gravity but nonetheless has occurred randomly even there. An empirical model for the conditions necessary to achieve sufficient stability to maintain detached growth for extended periods has been developed and will be presented. Methods for determining the nature and extent of detachment include profilometry and optical and electron microscopy. This surface study is the subject of another presentation at this Congress. Results in this presentation will show that we have established the effects of different ampoule materials, temperature profiles, pressure differences, and silicon concentrations and that samples that are nearly completely detached can be grown repeatedly.
Author
Ampoules; Crystal Growth; Detachment; Crystals; Stability

20010020026 California Univ., Lawrence Berkeley Lab., Berkeley, CA USA
Femtosecond photoelectron spectroscopy: a new tool for the study of anion dynamics
Greenblatt, B. J.; Feb. 01, 2000; 513p; In English
Report No.(s): DE00-008752; LBNL--42877; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A new experimental technique for the time-resolved study of anion reactions is presented. Using femtosecond laser pulses, which provide extremely fast (approximately 100 fs) time resolution, in conjunction with photoelectron spectroscopy, which

reveals differences between anion and neutral potential energy surfaces, a complex anion reaction can be followed from its inception through the formation of asymptotic products. Experimental data can be modeled quantitatively using established theoretical approaches, allowing for the refinement of potential energy surfaces as well as dynamical models. After a brief overview, a detailed account of the construction of the experimental apparatus is presented.
NTIS
Photoelectron Spectroscopy; Electron Emission; Spectroscopic Analysis; Anions

20010020071 NASA Marshall Space Flight Center, Huntsville, AL USA
Characterization of Surface Features in Detached Grown GeSi Crystals
Cobb, S. D., NASA Marshall Space Flight Center, USA; Volz, M. P., NASA Marshall Space Flight Center, USA; Schweizer, M., Universities Space Research Association, USA; Kaiser, N., Freiburg Univ., Germany; Carpenter, P. K., NASA Marshall Space Flight Center, USA; Szofran, F. R., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 52nd, 3 Oct. 2001, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

The growth of detached crystals by the Bridgman technique, in which the growing crystal is not in contact with the crucible wall, has been observed both on earth and in microgravity conditions. At present, the mechanisms contributing to the detachment are not completely understood and until recently detachment has not been reproducibly obtained. It is commonly understood that the main factors that promote the occurrence of detached growth include: high contact angle between the melt and the crucible material, high growth angle, and a pressure difference between the annular gap around the solid below the melt and the volume above the melt along the meniscus. These parameters were varied in Bridgman growth experiments to determine the conditions required to achieve detached growth terrestrially in Ge and GeSi alloys. These experiments are in preparation for experiments on the International Space Station (ISS). The detailed objectives of the flight experiments and a description of the growth methods employed are the subject of another presentation at this Congress. Detached crystals were achieved repeatedly in pyrolytic boron nitride ampoules when a pressure difference was employed. All crystals, except for those grown in fused silica ampoules, were easily removed from their containers; however, this fact alone is not sufficient to infer detached growth. Detachment was verified by comparing profilometer measurements of the radius of the samples with observations of the sample surfaces using optical and electron microscopy. The surfaces of the attached areas of the crystals had the same shape and surface texture as the interior crucible wall. Regions of detached growth contained many unique features and crystal facets could usually be observed. Several of these surface features have been correlated with mechanisms of detachment or free surface growth in general and others to processing events or conditions. These results will be compared with observations of surface features on detached regions of microgravity grown crystals.
Author
Crystal Growth; Detachment; Microgravity; Silica Glass; Bridgman Method

20010020214 NASA Marshall Space Flight Center, Huntsville, AL USA
Role of Vibration-Induced Streaming in Float-Zone Crystal Growth
Anikumar, A. V., Vanderbilt Univ., USA; Grugel, R. N., NASA Marshall Space Flight Center, USA; Lee, C. P., Vanderbilt Univ., USA; [2001]; 1p; In English; 39th; Aerospace Sciences, 10 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This presentation will examine in detail the role of vibration-induced streaming flow in the context of float-zone crystal growth. It is very well known that during float-zone materials processing, the naturally occurring temperature gradients along the zone surface impose a thermocapillary flow in the zone. Under certain processing conditions, the thermocapillary flow can also become nonsteady (oscillatory). The presence of thermocapillary flow is detrimental to crystal quality, for it can promote non-uniform dopant distribution and crystal striations. to null this effect we have imposed a counter streaming flow in the zone, via end-wall vibration. This technique has been adapted to float-zone processing of Sodium Nitrate-Barium Nitrate eutectic alloys, under both steady and nonsteady thermocapillary flow conditions. The beneficial effects of counter streaming flow have been clearly brought out through the before and after comparisons of the crystal microstructure. In addition, we are also examining the theoretical underpinnings of the balancing of thermocapillary flows with vibration-driven counter flows in float-zones.
Author
Crystal Growth; Float Zones; Steady Flow; Vibration; Thermocapillary Migration

20010020406 LeTourneau Univ., Research and Advanced Development Inst., Longview, TX USA
Diagnostics of Carbon Nanotube Formation in a Laser Produced Plume ***Final Report, 25 Oct. 1999 - 25 Oct. 2000***
DeBoer, Gary, LeTourneau Univ., USA; [2000]; 4p; In English
Contract(s)/Grant(s): NAG9-1174; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This research has involved the analysis and interpretation of spectroscopic data taken over a two year period from 1998 to 1999 at the Johnson Space Center. The data was taken in an attempt to perform diagnostic studies of the formation of carbon nanotubes in a laser produced plume. Carbon nanotubes hold great promise for the development of new materials with exciting properties. Current production processes are not sufficient to meet research and development needs. A better understanding of the chemical processes involved in carbon nanotube formation will suggest better production processes that would be more able to meet the demands of research and development. Our work has focused on analysis of the emission spectra and laser induced fluorescent spectra of the carbon dimer, C2, and the laser induced fluorescence spectra of the nickel atom, which is a necessary reagent in th formation of carbon nanotubes.
Derived from text
Carbon; Laser Induced Fluorescence; Nanotubes; Plumes; Spectroscopy; Emission Spectra

20010020605
Microscopic model for the non-linear fluctuating hydrodynamic of He-4 superfluid helium deduced by maximum entropy method
Alvarez, J.; Dec. 31, 1998; 237p; In Spanish; In English
Report No.(s): DE99-602959; INIS-MX-074; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This thesis presents a microscopic model for the non-linear fluctuating hydrodynamic of superfluid helium (He-4), model developed by means of the Maximum Entropy Method (Maxent). In the chapter 1, it is demonstrated the necessity to developing a microscopic model for the fluctuating hydrodynamic of the superfluid helium, starting from to show a brief overview of the theories and experiments developed in order to explain the behavior of the superfluid helium. On the other hand, it is presented the Morozov heuristic method for the construction of the non-linear hydrodynamic fluctuating of simple fluid. Method that will be generalized for the construction of the non-linear fluctuating hydrodynamic of the superfluid helium. Besides, it is presented a brief summary of the content of the thesis. In the chapter 2, it is reproduced the construction of a Generalized Fokker-Planck equation, (GFP), for a distribution function associated with the coarse grained variables. Function defined with aid of a nonequilibrium statistical operator (rho)hut(sub FP) that is evaluated as Wigneris function through (rho)(sub CG) obtained by Maxent. Later this equation of GFP is reduced to a non-linear local FP equation from considering a slow and Markov process in the coarse grained variables. In this equation appears a matrix D(sub mn) defined with a nonequilibrium coarse grained statistical operator (rho)hut(sub CG), matrix elements are used in the construction of the non-linear fluctuating hydrodynamics equations of the superfluid helium. In the chapter 3, the Lagrange multipliers are evaluated for to determine (rho)hut(sub CG) by means of the local equilibrium statistical operator (rho)hut(sub l)-tilde with the hypothesis that the system presents small fluctuations. Also are determined the currents associated with the coarse grained variables and furthermore are evaluated the matrix elements D(sub mn) but with aid of a quasi equilibrium statistical operator (rho)hut(sub qe) instead of the local equilibrium operator (rho)hut(sub l)-tilde. Matrix elements that lead to the local transport coefficients for the superfluid helium, by means of a generalization of the Green-Kubo fluctuation-dissipation relation, in analogy with the results present in the Appendix A, obtained with a local equilibrium statistical operator (rho)hut(sub l)-tilde. Specified the Lagrange multipliers, the currents and the local transport coefficients, a non-linear local FP equation is determined for the superfluid helium in the Fourier space. Starting with such FP equation their associated non-linear equations of the Langevin type are built, where the random forces that appear are of multiplicative type. Forces that are expressed as the product of Gaussian random variables and local variables in such way that the variances of the random variables are independent of the local variables. Finally, applying the Fourier inverse transformed to the non-linear equations of the Langevin type in the space of Fourier, the equations of the non-linear fluctuating hydrodynamic are built for the superfluid helium in the configuration space. Lastly, in the chapter 4, it is presented a discussion of the results and the conclusions of this thesis.
NTIS
Nonlinearity; Hydrodynamics; Helium Isotopes; Liquid Helium; Liquid Helium 2; Superfluidity

20010020640
Polaron and finite-barrier height effects on polarizabilities of shallow donors in quantum wells
Zorkani, I.; Filali, L.; Sep. 30, 1998; 25p; In English
Report No.(s): DE99-607936; IC/IR-98/16; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The polarizability and the ground state binding energy of a shallow donor in isolated Quantum Well were obtained within a variational calculation in the effective-mass approximation. Calculations with and without phonon were performed in GaAs/Ga(sub 1x)Al(sub x)As (alpha(sub 0)=0.0586) and CdTe/HgTe (alpha(sub 0)=0.315) QWs as a function of the electric field and of the size of the well for different values of the magnetic field strength. The calculations have been performed by sing suitable variational wave functions for infinite and finite confinement potentials. For a given value of the magnetic field, the polarizability

is found to be smaller than the zero-field case. The theoretical analysis shows that the polaronic effects enhance significantly the ground state binding energy, decrease the polarizability, increase with increasing well size and are more pronounced in infinite than in finite-barrier height.
NTIS
Polarization Characteristics; Polarons; Binding Energy

20010020641
Photoionization cross-section of shallow donors impurities at all magnetic fields
Zorkani, I.; Filali, L.; Sep. 30, 1998; 14p; In English
Report No.(s): DE99-607935; IC/IR-98/15; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The dependence of the photoionization cross-section for shallow donors on photon energy is calculated. The effects of strong and weak magnetic fields are considered by means of a variational wave function which is a linear combination of the cylindrical wave function and the oscillator one. Simple analytical expressions, valid for all magnetic fields, are obtained. It has been found that the photoionization cross-section is affected by the magnetic field. We give some results of Germanium.
NTIS
Photoionization; Impurities

20010020643
Lattice vibrations and elastic constants of crystalline He-4 and He-3 near low-temperature melting
Tozzini, V.; Tosi, M. P.; Sep. 30, 1998; 28p; In English
Report No.(s): DE99-607933; IC-98/139; No Copyright; Avail: Department of Energy Information Bridge

The phonon dispersion curves and the elastic constants are evaluated for crystalline He-4 and He-3 near melting at low temperature in the deep quantal regime. The structures considered are the hexagonal close-packed and the body-centered and face-centered cubic ones for He-4 and the body-centered cubic one for He-3. The calculations use a density functional approach to construct a field of effective force constants in the strongly anharmonic solid near melting from its Debye-Waller factor and from the linear density response function of the fluid phase at freezing. The results of the calculations are compared with the available experimental evidence: good agreement is generally found for transverse phonon frequencies and shear elastic constants, and phenomenological adjustments of the force-constant field are proposed for a quantitative description of the longitudinal modes. A relationship between the dispersion curves of phonons in crystalline He-4 and that of elementary collective excitations in superfluid He-4 is displayed and discussed in the light of current interpretations of atomic dynamics in the superfluid phase, with main emphasis on the region of the roton minimum.
NTIS
Helium Isotopes; Lattice Vibrations; Elastic Properties; Face Centered Cubic Lattices; Dispersion

20010020657 NASA Marshall Space Flight Center, Huntsville, AL USA
Synthesis of Carbon Nanotubes Array by CVD
Zhu, S., NASA Marshall Space Flight Center, USA; Su, C., NASA Marshall Space Flight Center, USA; Cochrane, J. C., NASA Marshall Space Flight Center, USA; Lehoczky, S. L., NASA Marshall Space Flight Center, USA; Muntele, I., NASA Marshall Space Flight Center, USA; Ila, D., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; NanoSpace, 13 Mar. 2001, Galveston, TX, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Since the properties of multi-wall carbon nanotubes (MWCNT) are superior in many devices such as electronics and sensors, many efforts have been involved in synthesizing particular structural or dimensional MWCNT. Uniform aligned MWCNT array is one of the prototype structures for devices such as filed emission device and microelectromechanical systems in which a large length to diameter ratio may also be required. Most aligned MWCNT recently synthesized by plasma enhanced chemical vapor deposition (CVD) have cone shaped structures. This presentation will illustrate aligned MWCNT array synthesized on silicon substrates using thermal CVD that could produce MWCNT with uniform diameter. An array of nickel particles was used as catalyst for MWCNT growth. A thin Ti or Au buffer layer was coated on the substrate prior to depositing nickel particles. Because the MWCNT size depends on the catalyst particle size, the nickel particle size annealed at various temperatures was investigated. MWCNT were grown on the substrate in the temperature range of 700 C - 1000 C and the pressure range of 1 to 300 torr. Methane and hydrogen gases with methane content of 1 - 10 % were used for the MWCNT synthesis. Morphology, length and diameter of MWCNT were determined by scanning electron microscopy and Raman spectroscopy. The detailed results of synthesis and characterizations will be discussed in the presentation.
Author
Nanotubes; Vapor Deposition; Nanotechnology

20010020683

Concentration dependence of partial vibrational spectra in Ni-Nb amorphous system

Syrykh, G. F.; Zemlyanov, M. G.; Ishmaev, S. N.; Sashin, I. L.; Dec. 31, 1998; 8p; In Russian; In English

Report No.(s): DE99-602125; JINR-R-14-97-402; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A neutron inelastic scattering study is presented of Ni44Nb56 metallic glass, with isotope substitution for Ni, and the results are compared to earlier data for Ni62Nb38 (Ni isotopic substitution). The ratio of the effective force constants, B(sub Ni)/B(sub Nb), is estimated to be 0.73 (+-) 0.01 for Ni44Nb56 alloy, that is bigger than for Ni62Nb38 alloy (0.60 (+-) 0.01). The results are in consistency with theoretical predictions.

NTIS

Vibrational Spectra; Amorphous Materials; Neutron Scattering; Isotopic Enrichment

20010020769

Semi-infinite anisotropic spin-1/2 Heisenberg ferromagnet

Benyoussef, A.; Boubekri, A.; Ez-Zahraouy, H.; Saber, M.; Aug. 31, 1998; 11p; In English

Report No.(s): DE99-607926; IC-98/121; No Copyright; Avail: Department of Energy Information Bridge

Using the effective field theory with a probability distribution technique that accounts for the self-spin correlation functions, the phase transitions in the semi-infinite anisotropic spin-1/2 Heisenberg ferromagnet on a simple cubic lattice are examined. For fixed values of the reduced exchange anisotropic parameter, the critical temperature of the system is studied as a function of the ratio R of the surface exchange couplings to the bulk ones. It was found that if R is less than or equal to R(sub c), the system orders at the bulk critical temperature T(sup B)(sub c)/J and if R is greater than = R(sub c), the system exhibits two successive transitions. The surface orders at the surface critical temperature T(sup S) (sub c)/J which is higher than T(sup B)(sub c)/J and as the temperature is lowered, in the presence of ordered surface, the bulk orders at T(sup B)(sub c)/J.

NTIS

Anisotropy; Spin; Phase Transformations; Ferromagnetism; Heisenberg Theory

20010020773

Nonlinearity effect on 1D periodic and disordered lattices

Senouci, K.; Zekri, N.; Bahlouli, H.; Sen, A. K.; Aug. 31, 1998; 18p; In English

Report No.(s): DE99-606817; IC-98/116; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Kronig-Penney model is used to study the effect of nonlinear interaction on the transmissive properties of both ordered and disordered chains. In the ordered case, the nonlinearity can either localize or delocalize the electronic states depending on both its sign and strength but there is a critical strength above which all states are localized. In the disordered case, however, we found that the transmission decays as T(approx)L(sup -(gamma)) around the band edge of the corresponding periodic system. The exponent (gamma) is independent of the strength of the nonlinearity in the case of disordered barrier potentials, while it varies with this strength for mixed potentials.

NTIS

Order-Disorder Transformations; Nonlinearity

20010020774

Order parameters of a spin-1 Ising film in a transverse field

Saber, A.; Ainane, A.; Dujardin, F.; Saber, M.; Stebe, B.; Aug. 31, 1998; 24p; In English

Report No.(s): DE99-606816; IC-98/115; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Using the effective field theory with a probability distribution technique that accounts for the self-spin correlation functions, the layer longitudinal magnetizations and quadrupolar moments of a spin-1 Ising film and their averages are examined. These quantities as functions of the temperature, the ratio of the surface exchange interactions to the bulk ones, the strength of the transverse field and the film thickness are calculated numerically and some interesting results are obtained.

NTIS

Ising Model; Thin Films

20010020779

Study of atomic jumps in quasi-crystals

Lyonnard, S.; May 07, 1997; 172p; In French; In English

Report No.(s): DE99-606806; FRCEA-TH-641; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The terminology phason used in quasicrystals to refer to atomic jumps. The study of the hopping process is important for the understanding of many basic issues in quasi-crystallography: structure, stability, diffusion, phase transitions between quasicrystals and approximants, mechanical properties. Quasi-elastic neutron scattering allows to find the characteristics of each elementary jump: chemical species involves, relaxation times, activation energies, jump distances and orientations. We performed a series of experiments in the perfect icosahedral phases AlFeCu and AlMnPd, on both powders and single domain samples, using time-of-flight, backscattering and triple axis spectrometers. We evidenced the existence of very fast phason hopping, and studied about ten different atomic jumps. An unusual temperature dependence has been found systematically: each process is assisted by a thermally activated mechanism. The assistance process has to be determined case by case, but the more plausible explanation invokes assistance by phonons or phason clouds. Moreover, the dependence of the quasi elastic signal as a function of the momentum transfer shows that the jumps are local and do not give rise to any long-range diffusion. Phason hopping mainly corresponds to the atom moving forwards and backwards between two energetically equivalent sites. Finally, we have been able to show that the jumps occur along the various quasi-crystalline symmetry axes.
NTIS
Atoms; Crystals; Crystallinity

20010020796
Interface magnetization effect in heterojunctions based on semimagnetic compounds
Malkova, N.; Jul. 31, 1998; 25p; In e
Report No.(s): DE99-605336; IC/IR-98/13; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The electronic states of stressed heterojunctions formed from narrow-gap semimagnetic semiconductors showing antiferromagnetic ordering are studies. The model Hamiltonian is constructed in the framework of the two-band envelope function approximation including far-band corrections. Heterojunctions both with normal and inverted band arrangements in the initial semiconductors are investigated. The interface Tamm-like states have been shown recently toe appear in these heterojunctions and they are spin-split with the magnetic axis perpendicular to the interface plane. The effect of far-band corrections is shown to be conditioned by the mutual movement of the constituent bands, resulting in changes and in some cases in full disappearance of the energy interval in which the interface state exists. The interface magnetization effect is expected when the Fermi level lies in one of the spin-polarized interface bands. Using the appropriate parameters, the value of the relative interface magnetization is calculated.
NTIS
Electron States; Heterojunctions; Magnetization; Semiconductors (Materials)

20010020884
Magneto-roton gap and the Laughlin State Stability
Cabo Montes de Oca, A.; Jul. 31, 1998; 8p; In e
Report No.(s): DE99-605333; IC-98/83; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
It is argued that the Girvin, MacDonald and Platzman (GMP) evaluation of the magneto-roton spectrum, in spite of probably being a sensible estimate of the excitation spectrum around the real FQHE ground state, does not imply the variational stability of the Laughlin state. The supplementary corrections needed to produce a variational calculation around the nu = 1/3 Laughlin state, are evaluated approximately. These preliminary results indicate the existence of lower lying states for a range of wavevector values.
NTIS
Ground State; Stability; Wave Functions

20010020886
Spin-wave analysis of the XXZ Heisenberg model with Dzyaloshinskii-Moriya interaction
Benyoussef, A.; Boubekri, A.; Ez-Zahraouy, H.; Aug. 31, 1998; 18p; In e
Report No.(s): DE99-605331; IC-98/102; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The effect of the Dzyaloshinskii-Moriya interaction on the stability of the Neel phase and the energy gap for the XXZ Heisenberg model on a d-dimensional hypercubic lattice is investigated using the linear spin-wave theory. In one-dimension, the disordered phase disappears above a critical value of the spin-axis anisotropy. In two-dimension, the instability of the Neel order occurs below a critical value of the easy-axis anisotropy. We find that for all d- dimensional systems, the energy gap vanishes above a critical value of the DM interaction.
NTIS
Energy Gaps (Solid State); Heisenberg Theory; Magnons

20010020888

Time decay and photoluminescence measurement of PbWO4 crystal ***Time decay and photoluminescence measurement of PbWO***

Baylac, M.; Sep. 30, 1997; 47p; In English

Report No.(s): DE99-605300; CEA-DAPNIA-SPHN-97-47; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report presented the experimental characterization of the PbWO4 crystals that we will be used for the photon detector of the Compton polarimeter at the Jefferson laboratory. We could draw 3 main features from this study. The transmission rate of the crystals is about 60% in the scintillation wavelength region. From the decay time analysis, we deduced 3 decay components of the PbWO(sub 4), predicted by other measurements: (tau)(sub 1)(approx)5 ns, (tau)(sub 2)(approx)20 ns, (tau)(sub 3)(approx)100 ns, taking respectively 26%, 30% and 4% of the total light amplitude emitted by the crystals. Moreover, we showed the existence of a fourth decay constant ((tau) (sub 4)(approx)1(mu)s) taking 40% of the total quantity of light which is responsible for the bad precision on the third constant determination. We could not characterize this component accurately because of the limited time range of the recordings. To improve the determination of the super-slow component, we need to perform the measurements again on a longer time scale, on the order of a few microseconds. We eventually measured the light yield of the PbWO4 crystals. With a first analysis, we found about 3.5 photoelectrons per MeV whereas the constructors note gave about 10. We then reduced the light loss in the experimental set up by wrapping the last open end of the crystal. The results were slightly improved. Eventually, we increased the recording time, to take account the super-low decay, and found that the crystals yield about 6 photoelectrons per MeV which is still less than predicted.

NTIS

Decay; Photoluminescence; Lead Tungstates; Tungsten Oxides; Crystals

20010020904

NMR study of Gd-Ni intermetallic compounds

Jesus, V. L. B.; Oliveira, I. S.; Guimaraes, A. P.; Barthem, V. M. T.; May 31, 1997; 9p; In English

Report No.(s): DE99-605284; CBPF-NF-032/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The spin echo Gd-155 and Gd-157 NMR was used to study the intermetallic compounds Gd2Ni17, GdNi5, GdNi3, GdNi2 and GdNi. These compounds have different crystal structures and order ferri or ferromagnetically. The measurements were performed at 4.2 K and 1.5 K. The NMR spectra were compared to computed line positions obtained from the diagonalization of the complete hyperfine Hamiltonian. The differences in the values of B(sub hf) at the two sites of Gd in Gd2Ni17 and GdNi3, of the order of 18 T and 6 T, respectively, may be justified, in a semi-quantitative way, through the RKKY model. We observed a strong quadrupole interaction at the Gd sites in the compounds GdNi5, Gd2Ni17, and in one of the sites of the compound Gd Ni3; in all these cases, the values of V(sub zz) are higher than 7.0 x 10(exp 21) V/sq m. The NMR results in Gd Ni are consistent with a direction of magnetization along the b axis. No NMR signal could be unambiguously attributed to Ni-61 nuclei. This work presents the first NMR results of the Gd-Ni intermetallic compounds.

NTIS

Intermetallics; Gadolinium Alloys; Nickel Alloys; Gadolinium Isotopes

20010021036

Search for an anomalous transmission of ultracold neutrons through metal foils

Muzychka, A.; Pokotilovskij, Y.; Geltenbort, P.; Dec. 31, 1998; 12p; In English

Report No.(s): DE99-602113; JINR-E-3-98-18; No Copyright; Avail: Department of Energy Information Bridge

The results are presented of the search for the anomalous transmission of ultracold neutrons (UCN) through beryllium (thickness 0.14 mm), stainless steel (0.05 and 0.015 mm) and copper (0.01 and 0.018 mm) foils. This anomalous transmission is considered as one of the possible reasons for UCN 'disappearance' from beryllium bottles, discovered in the experiments at St.Petersburg Nuclear Physics Institute, and was recently observed in the experiment. No transmission was found in our measurements at the level 10(sup - 7) except for the case of copper foils which we attribute to the admixture in the UCN flux of neutrons with the energies higher than the boundary energy for copper.

NTIS

Neutrons; Transmission; Nuclear Physics

20010021091

Research and development of fusion domains, Part 1, Studies on cluster science, *FY 1997*

Mar. 31, 1998; 110p; In Japanese

Report No.(s): DE99-707626; ETDE/JP-99707626-Pt-1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Studies were made on clusters which are thought to play important roles in status changes in substances (coagulation, crystallization and phase segregation) and chemical reactions (combustion, aqueous solution reaction and catalytic reaction). In the study of clusters by using infrared spectra, a method was developed to detect by using mass analyzer the cluster ion amount produced by dual resonance between resonantly enhanced multiphoton ionization (REMPI) and infrared lights. Fabrication of a Terahertz spectrometer was planned to enable high-resolution and high-accuracy observation on molecular clusters. Clusters consisting of silver atoms and ammonia molecules were successfully observed. A method was developed to investigate size dependence of cluster reactivity by using a Fourier converted ion cyclotron resonant mass analyzer. In addition, studies were conducted on clusters in liquids and aqueous solutions, clusters frozen in surface and matrix, and clusters stabilized in micro-space.

NTIS

Vapor Phases; Condensing; Crystallization; Atomic Clusters; Molecular Clusters

20010021161 State Univ. of New York, Dept. of Mechanical Engineering, Stony Brook, NY USA

Student Augmentation for Crystal Growth Research *Final Report, 1 Jun. 1995 - 31 May 1999*

Prasad, Vishwanath; May 1999; 7p; In English

Contract(s)/Grant(s): F49620-95-1-0387

Report No.(s): AD-A385726; AFRL-SR-BL-TR-01-0007; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Three graduate students and one undergraduate student were supported to pursue research in the area of crystal growth and complement the research activities of AFOSR/DARPA MURI project on integrated intelligent modeling, design and control of crystal growth processes. One doctoral student worked on integrating the radiation heat transfer model into MASTRAPP, the crystal growth model developed by the Consortium for Crystal Growth Research. He also built a parallel processing algorithm. The other two Masters and one undergraduate students worked in the area of experimental methods to develop database for model validation. These students have developed a three-dimensional temperature field visualization technique using liquid crystals as tracers and digital imaging software for 3D reconstruction. Reconstruction of 3D field from a series of 2D images is a novel technique and can be used for flow and heat transfer analysis that is inherently three-dimensional and oscillatory, e.g., melt flow in Czochralski crystal growth.

DTIC

Augmentation; Crystal Growth; Liquid Crystals

20010021393 NASA Ames Research Center, Moffett Field, CA USA

Molecular Dynamics Simulations of Carbon Nanotubes in Water

Walther, J. H., Eidgenoessische Technische Hochschule, Switzerland; Jaffe, R., NASA Ames Research Center, USA; Halicioglu, T., NASA Ames Research Center, USA; Koumoutsakos, P., Eidgenoessische Technische Hochschule, Switzerland; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 5-20; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

We study the hydrophobic/hydrophilic behavior of carbon nanotubes using molecular dynamics simulations. The energetics of the carbon-water interface are mainly dispersive but in the present study augmented with a carbon quadrupole term acting on the charge sites of the water. The simulations indicate that this contribution is negligible in terms of modifying the structural properties of water at the interface. Simulations of two carbon nanotubes in water display a wetting and drying of the interface between the nanotubes depending on their initial spacing. Thus, initial tube spacings of 7 and 8 A resulted in a drying of the interface whereas spacing of is greater than 9 A remain wet during the course of the simulation. Finally, we present a novel particle-particle-particle-mesh algorithm for long range potentials which allows for general (curvilinear) meshes and ”black-box” fast solvers by adopting an influence matrix technique.

Author

Molecular Dynamics; Computerized Simulation; Nanotubes; Dynamic Models; Hydrophobicity; Wettability

77
PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.

20010020416 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA
Atom Wave Interferometers ***Annual Report, 1 Dec. 1999-30 Nov. 2000***
Pritchard, David; Sep. 19, 2000; 16p; In English
Contract(s)/Grant(s): N00014-96-1-0432
Report No.(s): AD-A385516; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Long-term research objective: Matter wave interferometers, in which de Broglie waves are coherently split and then recombined to produce interference fringes, have opened exciting new possibilities for precision and fundamental measurements with complex particles. The aim of our research program is to extend the ideas and techniques of atom optics and atom interferometry which underlie atom interferometers, to use these devices to make qualitatively new and/or more precise measurements in atomic physics, and to perform fundamental experiments in quantum mechanics based on our ability to measure interactions that displace the de Broglie wave phase or change the quantum coherence of the beams (reducing the amplitude of the interference pattern).
DTIC
Quantum Theory; Atomic Physics; Electromagnetic Radiation; Interferometers

20010020614
SU(2)-monopole: interbasis expansion
Mardoyan, L. G.; Sissakian, A.; Dec. 31, 1998; 11p; In English; Quantum Groups Deformation and Contractions, 17-24 Sep. 1997, Istanbul, Turkey
Report No.(s): DE99-602111; JINR-E-2-98-15; No Copyright; Avail: Department of Energy Information Bridge

This article deals with a nonrelativistic quantum mechanical study of a charge-dyon system with the SU(2)-monopole in five dimensions. The Schroedinger equation for this system is separable in the hyperspherical and parabolic coordinates. The problem of interbasis expansion of the wave functions is completely solved. The coefficients for the expansion of the parabolic basis in terms of the hyperspherical basis can be expressed through the Clebsch-Gordan coefficients of the SU(2) group.
NTIS
Monopoles; Quantum Mechanics; Series Expansion

20010020636
Non-Markovian relative diffusion of stochastic magnetic lines
Misguich, J. H.; Steinbrecher, G.; Negrea, M.; Pometescu, N.; Nov. 30, 1997; 20p; In English
Report No.(s): DE99-609074; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper, we study some aspects related to the spatial relative diffusion of the magnetic-field lines. The nonlinear integral equation for the Lagrangian correlation is transformed into a system of two ordinary differential equations and solved numerically. The system of linear integral- differential equations for the moments is analyzed numerically for different values of the alpha-parameter (which is proportional to the ratio of parallel and perpendicular correlation lengths). A critical value for alpha (alpha (sub crit) = 0.3251) is obtained in a shearless stochastic magnetic-field model. For alpha > alpha(sub crit) the rate of damping of the anisotropy becomes complex, that means an oscillatory behavior for the correlations and anisotropies. For alpha (alpha)(sub crit) we find the well known behavior described in the literature for alpha is much less than 1.
NTIS
Diffusion; Magnetic Fields

20010020644
Hidden supersymmetry and Berezin quantization of N=2, D=3 spinning superparticles
Gorbunov, I. V.; Lyakhovich, S. L.; Sep. 30, 1998; 36p; In English
Report No.(s): DE99-607932; IC-98/138; No Copyright; Avail: Department of Energy Information Bridge

The first quantized theory of N=2, D=3 massive superparticles with arbitrary fixed central charge and (half) integer or fractional superspin is constructed. The quantum states are realized on the fields carrying a finite dimensional, or a unitary infinite dimensional representation of the super groups OSp(2 vertical-bar 2) or SU(1, 1 vertical-bar 2). The construction originates from quantization of a classical model of the superparticle we suggest. The physical phase space of the classical superparticle is embedded in a symplectic superspace T*(R(sup 1,2)) x L(sup 1) (sup vertical-bar) 2, where the inner Kaehler supermanifold L(sup

1) (sup vertical-bar) 2 (approx-equal) OSp(2 vertical-bar 2)/(U(1) x U(1)) (approx-equal) SU (1, 1 vertical-bar 2)/(U(2) vertical-bar 2 x U(1)) provides the particle with super-spin degrees of freedom. We find the relationship between Hamiltonian generators of the global Poincare supersymmetry and the 'internal' SU(1, 1 vertical-bar 2) one. Quantization of the superparticle Combines the Berezin quantization on L(sup 1) (sup vertical-bar) 2 and the conventional Dirac quantization with respect to space-time degrees of freedom. Surprisingly, to retain the supersymmetry, quantum corrections are required for the classical N=2 supercharges as compared to the conventional Berezin method. These corrections are derived and the Berezin correspondence principle for L(sup 1) (sup vertical-bar) 2 underlying their origin is verified. The model admits a smooth contraction to the N=1 supersymmetry in the BPS limit.
NTIS
Supersymmetry; Measurement; Particles

20010020645
Yang-Baxter equation on two-dimensional lattice and some infinite dimensional algebras
Daoud, M.; Douari, J.; Hassouni, Y.; Sep. 30, 1998; 15p; In English
Report No.(s): DE99-607931; IC-98/132; No Copyright; Avail: Department of Energy Information Bridge
We show that the Yang-Baxter equation is equivalent to the associativity of the algebra generated by non-commuting link operators. Starting from these link operators, we build out the (FFZ) algebras, the slq(2) is derived by considering a special combination of the generators of (FFZ) algebra.
NTIS
Algebra; Lattices (Mathematics)

20010020674
Methods of solution of the Schroedinger equation with non-Hermitian Hamiltonian
Kostenko, B.; Dec. 31, 1998; 16p; In Russian
Report No.(s): DE99-602134; JINR-R-4-97-388; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Methods of solution of the Schroedinger equation with non-Hermitian Hamiltonian H cap = H(sub 1) cap + iH(sub 2) cap, where H(sub i)(sup +) cap = H(sub i) cap and (H(sub 1) cap, H(sub 2) cap) not equal 0, are discussed using an exactly solvable quantum model. Some arguments about mathematical and physical consistency of the model are presented. A solution of Wigner's paradox concerning impossibility to describe selfreproducing systems in the frame of quantum mechanics is given.
NTIS
Hamiltonian Functions; Quantum Mechanics; Schroedinger Equation; Annihilation Reactions

20010020675
Irreproducibility of thermal and nuclear anomalies in palladium deuteride
Kostenko, B. F.; Yurev, M. Z.; Dec. 31, 1998; 8p; In Russian
Report No.(s): DE99-602133; JINR-R-4-97-387; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The probability of observation of thermal and nuclear anomalies in PdD(sub x) is calculated assuming a physical mechanism of phonon laser type to take place. It is shown that poor reproducibility of these results has natural quantum mechanical explanation.
NTIS
Annihilation Reactions; Deuterides; Nuclear Fusion; Palladium

20010020677
About probabilistic interpretation of the wave function of the Klein-Fok-Gordon (KFG) equation
Beshtoev, K.; Shogenov, V.; Dec. 31, 1998; 11p; In Russian
Report No.(s): DE99-602131; JINR-R-2-98-4; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
An approach for the interpretation of the wave function of the KFG equation is proposed. Then for the one particle solution of the KFG equation we can construct the positive defined value i.e. to introduce a probability density. A relativistic generalization of the Feynman approach to superconductivity is given.
NTIS
Probability Theory; Superconductivity; Wave Functions; Klein-Gordon Equation

20010020678

Anapole or toroidal dipole moment

Bukina, E. N.; Dubovik, V. M.; Kuznetsov, V.; Dec. 31, 1998; 19p; In Russian

Report No.(s): DE99-602130; JINR-R-2-97-412; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Relations between all kinds of explicitly covariant phenomenological representations of the non-diagonal on masses electromagnetic currents of bispinor particles with s=1/2 and their correspondence to the implicitly covariant multipole parametrization of classical current are analyzed in details. The representations with kinematical constraints are revealed. It is emphasized that e.g. the anapole representation of pseudovector current nullifying radiation of this current. Among its admissible explicitly covariant representations there is a universal one in which form factors are normalized to the charge dipole moment and toroidal one permitting one to describe any, including on-mass and off-mass, processes with parity either charged or nonconserved.

NTIS

Dipole Moments; Parameterization; Form Factors; Particle Spin

20010020679

Introduction to intrinsic reference frames of transitional processes on the example of 2-particle decay

Bukina, E. N.; Dubovik, V. M.; Kuznetsov, V.; Dec. 31, 1998; 23p; In Russian

Report No.(s): DE99-602129; JINR-R-2-97-411; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In quantum relativistic physics transition processes are considered within special frames of reference which kinematics of processes becomes symmetric in certain respects. For elastic processes the list of convenient frames of reference is well known. For inelastic ones this list can be supplemented. We propose a general procedure of introducing Lorentz frames of reference for arbitrary processes. As an example we discuss the relativistic kinematics of a two-body decay in different frames of reference among which we distinguish a frame that we call a proper one for the process considered in the whole. The formulas obtained are useful for treatment of weak electromagnetic processes involving heavy quarks such as hyperon decays and more complicated hadron reactions.

NTIS

Particle Decay; Quantum Mechanics; Momentum Transfer; Elementary Particle Interactions; Weakly Interacting Massive Particles

20010020680

Heavy quarkonia in a bilocal effective theory

Akishin, P. G.; Kalinovskij, Y.; Dec. 31, 1998; 28p; In Russian

Report No.(s): DE99-602128; JINR-R-2-97-404; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The effective model of the unified description of quarkonia by the covariant generalization of the instantaneous interaction is considered. It is shown that low energy theorems of the chiral algebra (spontaneously symmetry breaking, Goldstone theorem), a nonrelativistic limit for heavy quarkonia and a heavy quark symmetry in the framework of the model are reproduced. The solutions of the Schwinger-Dyson and Bethe-Salpeter equations for light and heavy quarkonia and their excitations are obtained.

NTIS

Bethe-Salpeter Equation; Broken Symmetry; Quarks; Excitation; Chiral Dynamics

20010020681

Description of proton characteristics in np-interactions at P (sub n)=3.83 and 5.1 GeV/c within the framework of FRITIOF model

Gankhuyag, B.; Uzhinskij, V.; Dec. 31, 1998; 12p; In Russian; In English

Report No.(s): DE99-602127; JINR-R-2-97-397; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Proton distributions on rapidity and transverse momentum in the reactions np (yields) pp(pi)(sup -), np (yields) pp(pi)(sup -)(pi)(sup 0) and np (yields) np(pi)(sup +)(pi)(sup -) are analyzed. It is shown that primary FRITIOF model reproduces the considered characteristics only qualitatively. Taking into account a charge exchange between colliding nucleons and tuning the transferred transverse momentum allows one to reach the better description. At the same time the description of (pi)-meson characteristics becomes something worse. So, due to choosing of model parameters a complex description of np-interactions is reached.

NTIS

Protons; Transverse Momentum

20010020767

Aspects of six dimensional supersymmetric theories

Randjbar-Daemi, S.; Aug. 31, 1998; 15p; In English

Report No.(s): DE99-607928; IC-98/127; No Copyright; Avail: Department of Energy Information Bridge

In this contribution, some aspects of supergravity and super Yang-Mills systems in D=6 are briefly reviewed and, in some cases, are contrasted with the analogues features in D=4. Particular emphasis is laid on the stringy solutions of the D=6 super Yang=Mills systems.

NTIS

Supersymmetry; Supergravity; Yang-Mills Theory

20010020776

Threshold corrections to the missing doublet supersymmetric SU(5) grand unified theory

Wimal Lalith De Alwis, A. C.; Aug. 31, 1998; 42p; In English

Report No.(s): DE99-606814; IC-98/106; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Threshold corrections have been done to the missing doublet supersymmetric SU(5) grand unified theory.

NTIS

Correction; Supersymmetry; Grand Unified Theory

20010020797

General solution of string inspired nonlinear equations

Bandos, I. A.; Ivanov, E.; Kapustnikov, A. A.; Ulanov, S. A.; Jul. 31, 1998; 23p; In e

Report No.(s): DE99-605335; IC-98/94; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We present the general solution of the system of coupled nonlinear equations describing dynamics of D-dimensional bosonic string in the geometric (or embedding) approach. The solution is parametrized in terms of two sets of the left- and right-moving Lorentz harmonic variables providing a special coset space realization of the product of two (D-2) dimensional spheres S(sup D-2)= SO(1,D-1)/SO(1,1)xSO(D-2) contained in K(sub D-2).

NTIS

Nonlinear Equations; String Theory; Bosons

20010020798

Seiberg - Witten theory in the framework of complex geometry

Tyurin, N.; Jul. 31, 1998; 22p; In e

Report No.(s): DE99-605334; IC-98/89; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper we consider the Seiberg - Witten theory from the point of view of the complex geometry. Some generalization of the Taubes method for symplectic manifolds are established.

NTIS

Complex Variables; Manifolds (Mathematics); Curves (Geometry)

20010020885

Threshold corrections to the minimal SUSY SU(5) grand unified theory

Wimal Lalith De Alwis, A. C.; Aug. 31, 1998; 18p; In e

Report No.(s): DE99-605332; IC-98/105; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Threshold corrections have been carried out at low and high energy scales to the minimal supersymmetric SU(5) grand unified theory. More refined values for the Weinberg angle and strong coupling constant are predicted which are fully consistent with the latest experimental values.

NTIS

Supersymmetry; Grand Unified Theory; Strong Interactions (Field Theory)

20010020887

AdS(sub 3) x R as a target space for the (2,1) string theory

O'Loughlin, M. J.; Randjbar-Daemi, S.; Aug. 31, 1998; 13p; In English

Report No.(s): DE99-605330; IC-98/100; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We study a target space geometry of the form AdS(sub 3)xR for the (2,1) heterotic string. This target space arises as the near horizon limit of a solitonic configuration in 2+2 dimensions. We investigate the null isometries of this space and discuss the specific reduction to 1+1 dimensions of the target space geometry arising from the consistent gauging of one of these isometries.
NTIS
Space-Time Functions; String Theory

20010020889
Forces unification in physics: the first attempts
Leite Lopes, J.; Dec. 31, 1996; 11p; In French; In English
Report No.(s): DE99-605299; CBPF-NF-081/96; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The author proceeds a summary review on the works which originated the electroweak model of electromagnetic interactions unification with the weak interactions.
NTIS
Electroweak Model; Electromagnetic Interactions; Weak Interactions (Field Theory)

20010020892
Yang-Mills-SU(2) via FORM
Boldo, J. L.; Machado de Moraes, L.; Duarte Peres, P.; Macedo Jorge, P.; Sep. 30, 1997; 21p; In English
Report No.(s): DE99-605296; CBPF-NF-056/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Formal calculation is performed in the context of a Yang-Mills theory, with SU(2) group, using the resources of the FORM software.
NTIS
Yang-Mills Theory; Yang-Mills Fields; Field Theory (Physics); Supersymmetry

20010020894
Analysis of chiral symmetry breaking mechanism
Xin-Heng, G.; Tao, H.; Chuang, W.; Jul. 31, 1997; 31p; In English
Report No.(s): DE99-605294; CBPF-NF-045/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The renormalization group invariant quark condensate (mu) is determinate both from the consistent equation for quark condensate in the chiral limit and from the Schwinger-Dyson (SD) equation improved by the intermediate range QCD force singular like (delta) (q) which is associated with the gluon condensate. The solutions of (mu) in these two equations are consistent. We also obtain the critical strong coupling constant (alpha)c above which chiral symmetry breaks in two approaches. The nonperturbative kernel of the SD equation makes (alpha)c smaller and (mu) bigger. An intuitive picture of the condensation above (alpha)c is discussed. In addition, with the help of the Slavnov-Taylor-Ward (STW) identity we derive the equations for the nonperturbative quark propagator from SD equation in the presence of the intermediate-range force is also responsible for dynamical chiral symmetry breaking.
NTIS
Broken Symmetry; Chirality; Supersymmetry

20010020895
Hadronic correction to Coulomb potential between quarks and diquark structure
Xin-Heng, G.; Xue-Qian, L.; Peng-Nian, S.; Chuang, W.; Jul. 31, 1997; 20p; In English
Report No.(s): DE99-605293; CBPF-NF-044/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We have studied the hadronic correction from the background pion fields due to the chiral symmetry breaking to the Coulomb potential that governs the short-distance behavior of the interactions between the bound quarks. The background fields are associated with the constituent quark mass. We find a modified form which favors the diquark structure. We also roughly estimate an influence of this correction on the phase shifts in nucleon scattering and find that it may cause an extra middle range attraction between nucleons which is expected.
NTIS
Hadrons; Coulomb Potential; Charged Particles; Quarks; Quark Models

20010020896

Algebraic renormalization perturbative twisted considerations on topological Yang-Mills theory and on N=2 supersymmetric gauge theories

Fucito, F.; Tanzini, A.; Vilar, L. C. Q.; Ventura, O. S.; Sasaki, C. A. G.; Jul. 31, 1997; 50p; In English

Report No.(s): DE99-605292; CBPF-NF-043/97; HEP-TH-9707209; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The aim of these notes is to provide a simple and pedagogical (as much as possible) introduction to what is nowadays commonly called Algebraic Renormalization. As the same itself let it understand, the Algebraic Renormalization gives a systematic set up in order to analyze the quantum extension of a given set of classical symmetries. The framework is purely algebraic, yielding a complete characterization of all possible anomalies and invariant counterterms without making use of any explicit computation of the Feynman diagrams. This goal is achieved by collecting, with the introduction of suitable ghost fields, all the symmetries into a unique operation summarized by a generalized Slavnov-Taylor (or master equation) identity which is the starting point for the quantum analysis. The Slavnov-Taylor identity allows to define a nilpotent operator whose cohomology classes in the space of the integrated local polynomials in the fields and their derivatives with dimensions bounded by power counting give all nontrivial anomalies and counterterms. In other words, the proof of the renormalizability is reduced to the computation of some cohomology classes.

NTIS

Algebra; Yang-Mills Theory; Yang-Mills Fields; Gauge Theory; Field Theory (Physics); Perturbation Theory

20010020897

No-Go theorem for the nonabelian topological mass mechanism in four dimensions

Henneaux, M.; Lemes, V. E. R.; Sasaki, C. A. G.; Ventura, O. S.; Vilar, L. C. Q.; Jul. 31, 1997; 15p; In English

Report No.(s): DE99-605291; CBPF-NF-041/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We prove that there is no power-counting renormalizable nonabelian generalization of the Abelian topological mass mechanism in four dimensions. The argument is based on the technique of consistent deformations of the master equation developed by G. Barnich and one of the authors. Recent attempts involving extra fields are also commented upon.

NTIS

Group Theory; Topology

20010020898

Bogomol'nyi equations in gauge theories

Cunha, M. S.; Christiansen, H. R.; Almeida, C. A. S.; Jul. 31, 1997; 20p; In English

Report No.(s): DE99-605290; CBPF-NF-040/97; HEP-TH-9706206; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

By imposing self-duality conditions, we obtain the explicit form in which gauge theories spontaneously breakdown in the Bogomol'nyi. In this context, we reconsider the Abelian Higgs and Maxwell-Chern-Simons Higgs models. On the same footing, we find a topological Higgs potential for a Maxwell-Chern-Simons extended theory presenting both minimal and nonminimal coupling. Finally, we perform a numerical calculation in the asymmetric phase and show the solutions to the self-dual equations of motion of the topological theory. We argue about certain relations among the parameters of the model in order to obtain such vortex configurations.

NTIS

Gauge Theory; Yang-Mills Fields; Group Theory

20010020900

Topics on the FORM software

Costa Jorge, P. M.; Peres, P. D.; Jun. 30, 1997; 58p; In Portuguese; In English

Report No.(s): DE99-605288; CBPF-NF-037/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

These notes studies the compilation with FORM software as applied to high energy physics, covering the following topics: Command structures, statistics and numbers, Dirac matrices, optimization control, Gamma matrices, errors and polynomial substitution.

NTIS

High Energy Interactions; Nuclear Physics; Nuclear Reactions

20010020902

Yang-Mills- SU(3) via FORM

Costa Jorge, P. M.; Peres, P. D.; Boldo, J.; Jun. 30, 1997; 18p; In English

Report No.(s): DE99-605286; CBPF-NF-035/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This work uses FORM software aspects for obtaining a series of formal results in the non-Abelian gauge theory, with SU(3) group. The work also studies field transformation, Lagrangian density invariance, field equations, energy distribution and the theory reparametrization in terms of fields associated to particles which are possible to be detected in accelerators.

NTIS

Yang-Mills Theory; Yang-Mills Fields; Gauge Theory; Supersymmetry

20010020905

Off-diagonal helicity density matrix elements for vector mesons produced at LEP

Anselmino, M.; Bertini, M.; Murgia, F.; Quintairos, P.; May 31, 1997; 13p; In English

Report No.(s): DE99-605283; CBPF-NF-031/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Final state q q-bar interactions may give origin to non zero values of the off-diagonal element (rho)(sub 1) of the helicity density matrix of vector mesons produced in e(sup +)e(sup -) annihilations, as confirmed by recent OPAL data on (phi) and D(sup *)'s. Predictions are given for (rho)1,-1 of several mesons produced at large z and small PT, collinear with the parent jet; the values obtained for (theta) and D(sup *) are in agreement with data.

NTIS

Vector Mesons; Electron-Positron Pairs; Annihilation Reactions; Electron Scattering; Positron Annihilation

20010020906

One-loop dimensional reduction of the linear (sigma) model

Malbouisson, A. P. C.; Silva-Neto, M. B.; Svaiter, N.; May 31, 1997; 14p; In English

Report No.(s): DE99-605282; CBPF-NF-029/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We perform the dimensional reduction of the linear (sigma) model at one- loop level. The effective of the reduced theory obtained from the integration over the nonzero Matsubara frequencies is exhibited. Thermal mass and coupling constant renormalization constants are given, as well as the thermal renormalization group which controls the dependence of the counterterms on the temperature. We also recover, for the reduced theory, the vacuum instability of the model for large N.

NTIS

Linear Systems; Field Theory (Algebra)

20010020908

SU(2,R)(sub q) symmetries of non-Abelian Toda theories

Gomes, J. F.; Zimerman, A. H.; Sotkov, G.; Mar. 31, 1998; 16p; In English

Report No.(s): DE99-605280; CBPF-NF-018/98; IFT-P-017/97; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The classical and quantum algebras of a class of conformal NA-Toda models are studied. It is shown that the SL (2,R)(sub q). Poisson brackets algebra generated by certain chiral and antichiral charges of the nonlocal currents and the global U(1) charge appears as an algebra of the symmetries of these models.

NTIS

Broken Symmetry; Algebra; Quantum Theory

20010020909

Path-integral approach for bosonic effective theories for Fermion fields in four and three dimensions

Botelho, L. C. L.; Feb. 28, 1998; 17p; In English

Report No.(s): DE99-605279; CBPF-NF-013/98; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We study four dimensional Effective Bosonic Field Theories for massive fermion field in the infrared region and massive fermion in ultraviolet region by using an appropriate Fermion Path Integral Chiral variable change and the Polyakov's Fermi-Bose transmutation in the 3D-Abelian Thrirring model.

NTIS

Fermions; Boson Fields

20010020957

8D oscillator as a hidden SU(2)-monopole

Mardoyan, L. G.; Sisakyan, A. N.; Ter-Antonyan, V.; Dec. 31, 1998; 15p; In English

Report No.(s): DE99-602110; JINR-E-2-98-14; No Copyright; Avail: Department of Energy Information Bridge

In the framework of an analytical approach and with the help of the generalized version of the Hurwitz transformation the five-dimensional SU(2)-monopole model is constructed from the eight-dimensional quantum oscillator. The Clebsch-Gordan expansion stimulated by the space-gauge coupling, the hyperangle and the radial parts of the total wave function, the energy spectrum of the charge-monopole bound system and the corresponding degeneracy are calculated.

NTIS

Monopoles; Harmonic Oscillators

20010020958

Yang-Mills-Higgs solitons dynamics in (2+1)-dimensions

Getmanov, B. S.; Sutcliffe, P. M.; Dec. 31, 1998; 23p; In English

Report No.(s): DE99-602109; JINR-E-2-97-420; No Copyright; Avail: Department of Energy Information Bridge

Dimensional reduction of the self-dual Yang-Mills (sd YM) equation in (2+2) dimensions produces an integrable Yang-Mills-Higgs-Bogomolny equation in (2+1) dimensions. For an SU(1,1) gauge group a t'Hooft-like ansatz is used to construct a monopole-like solution and an N-soliton-type solution, which describes static deformed monopoles together with exotic monopole dynamics, including transmutation. Finally, we show how our monopole solution has a surprisingly simple form in terms of the twistor construction, and make some remarks regarding multimonopole solutions.

NTIS

Yang-Mills Theory; Solitary Waves

20010020959

Rho-meson and related meson wave functions in QCD sum rules with nonlocal condensates

Bakulev, A. P.; Mikhajlov, S.; Dec. 31, 1998; 15p; In English

Report No.(s): DE99-602108; JINR-E-2-97-419; No Copyright; Avail: Department of Energy Information Bridge

We apply the nonlocal condensate formalism and construct generalised QCD sum rules (including O((alpha)(sub s))-radiative corrections) for (rho)-, (rho) (sup ')- and b(sub 1)-meson wave functions of twist 2. As a byproduct we predict the lepton decay constant f(sub (rho)(sup ')) and estimate the mass of (rho)(sup ')-meson. For all these mesons we obtain the first 10 moments of wave functions and suggest the models for the last. These results are compared with those of Chernyak and Zhitnitsky and of Ball and Braun.

NTIS

Rho-Mesons; Wave Functions

20010020960

Correspondence between the dynamics with odd and even brackets and generalized Nambu's mechanics

Makhaldiani, N.; Voskresenskaya, O.; Dec. 31, 1998; 11p; In English

Report No.(s): DE99-602107; JINR-E-2-97-418; No Copyright; Avail: Department of Energy Information Bridge

We consider selected problems of Hamiltonization and integrability of a general dynamical system described by a system of ordinary differential equations; odd and even symplectic structures; a new approach to the linearization of non-linear systems by the extended Hamiltonian and Nambu's mechanics.

NTIS

Brackets; Differential Equations; Linearization

20010020961

Some modifications of nonlinear n-field model and their exact particle- like solutions in d-dimensions

Makhaldiani, N.; Dec. 31, 1998; 8p; In English

Report No.(s): DE99-602106; JINR-E-2-97-408; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

For one of them, with variable mass parameter, an explicit particle-like solution in the d-dimensional case is found. Field-theoretic arguments for the proposed variable mass are given.

NTIS

Elementary Particles; Revisions

20010020964

Hecke algebraic properties of dynamical R-matrices. Application to related quantum matrix algebras

Khadzhiivanov, L. K.; Todorov, I. T.; Isaev, A. P.; Pyatov, P. N.; Ogievetskij, O. V.; Dec. 31, 1998; 35p; In English

Report No.(s): DE99-602103; JINR-E-2-97-370; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The quantum dynamical Yang-Baxter (or Gervais-Neveu-Felder) equation defines an R-matrix R cap (p), where p stands for a set of mutually commuting variables. A family of SL (n)-type solutions of this equation provides a new realization of the Hecke algebra. We define quantum antisymmetrizers, introduce the notion of quantum determinant and compute the inverse quantum matrix for matrix algebras of the type R cap (p) a(sub 1)a(sub 2) = a(sub 1)a(sub 2)R cap. It is pointed out that such a quantum matrix algebra arises in the operator realization of the chiral zero modes of the WZNW model.

NTIS

Algebra; Quantum Theory; Operators (Mathematics); Matrix Theory

20010021030

Study of influence of (Delta)(sup ++)((Delta)(sup -)) isobar production on the sizes of the pion emission region in np-interactions at P(sub n)=5,2(+/-)0, 16 GeV/c using the interference correlation method for identical particles

Troyan, Y.; Pechenov, V. N.; Plekhanov, E. B.; Troyan, A.; Arakelyan, S.; Dec. 31, 1998; 16p; In Russian; In English

Report No.(s): DE99-602120; JINR-R-1-97-400; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The sizes of the pion emission region in the np-interactions were determined for the reaction channels np (yields) pp (pi)(sup +)(pi)(sup -)(pi) (sup -) (1), np (yields)pp(pi)(sup +)(pi)(sup -)(pi)(sup -)(pi)(sup 0) (2) and np (yields) np(pi)(sup +)(pi)(sup +)(pi)(sup -)(pi)(sup -) (3) by means of the method of identical particle interference correlations. For reaction channels (1) and (3) the influence of (Delta)(sup ++)((Delta)(sup -)) isobar production on the sizes of the identical pion emission was investigated. In the analysis the background constructed by means of our method of the mixing with 'the minimal violation of kinematical correlations' was used. The experimental material involving 33165 pairs of identical pions from 5 prong events, which was obtained by irradiation of the 1 m hydrogen chamber of LHE (JINR) with the beam of quasimonochromatic neutrons, has been used for the analysis.

NTIS

Pions; Particle Production; Nuclear Isobars

20010021037

Weyl non-Abelian gauge field and the Thomas precession

Barbashov, B. M.; Pestov, A.; Dec. 31, 1998; 7p; In English

Report No.(s): DE99-602112; JINR-E-2-98-5; No Copyright; Avail: Department of Energy Information Bridge

The connection between the Fermi-Walker transport and the Weyl non-Abelian gauge field is established. A theoretical possibility of detecting the Weyl gauge field caused by the Thomas precession of a gyroscope is discussed.

NTIS

Precession; Measuring Instruments

20010021116 NASA Glenn Research Center, Cleveland, OH USA

Thermodynamic Data for Fifty Reference Elements

McBride, Bonnie J., NASA Glenn Research Center, USA; Gordon, Sanford, Sanford Gordon and Associates; Reno, Martin A., Heidelberg Coll., USA; February 2001; 248p; In English

Contract(s)/Grant(s): RTOP 708-87-13

Report No.(s): NASA/TP-3287/REV1; E-6874-1; NAS 1.60:3287/REV1; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This report is a compilation of thermodynamic functions of 50 elements in their reference state. The functions are: C(sup 0, sub p), {H(T)-H(sup 0)(0)}, S(sup 0)(T), and - {G(sup 0)(T) - H(sup 0)(0)} for the elements Ag, Al, Ar, B, Ba, Be, Br2, C, Ca, Cd, Cl2, Co, Cr, Cs, Cu, F2, Fe, Ge, H2, He, Hg, I2, K, Kr, Li, Mg, Mn, Mo, N2, Na, Nb, Ne, Ni, O2, P, Pb, Rb, S, Si, Sn, SR, Th, Th, Ti, U, V, W, Xe, Zn, and Zr. Deuterium D, and electron gas e(sup -) are also included. The data are tabulated as functions of temperature as well as given in the form of least-squares coefficients for two functional forms for C(sup 0, sub p) with integration constants for enthalpy and entropy. One functional form for C(sup 0, sub p) is a fourth-order polynomial and the other has two additional terms, one with T(sup -1) and the other with T(sup -2). The gases Ar, D2, e(sup -), H2, He, Kr, N2, Ne, O2, and Xe are tabulated for temperatures from 100 to 20 000 K. The remaining gases Cl2 and F2 are tabulated from 100 to 6000 K. The polynomial functional form for C(sup 0, sub p) for all these gases is split into two temperature intervals of 200 to 1000 K and 1000 to 6000 K. The second functional form for (sup 0, sub p) has an additional interval from 6000 to 20 000 K for the gases tabulated

to 20 000 K. The fits are constrained so that the properties match at the common temperature endpoints. The temperature ranges for the condensed species vary with range of the data, phase changes, and shapes of the C(sup 0, sub p) curves.
Author
Thermodynamics; Oxygen; Nitrogen; Hydrogen; Deuterium

20010021380 Illinois Univ., Dept. of Physics, Chicago, IL USA
Advanced Computational Physics Instrumentation ***Final Report, 1 Mar. 1999 - 31 Aug. 2000***
Rhodes, Charles K.; Aug. 1999; 129p; In English
Contract(s)/Grant(s): DAAD19-99-1-0052
Report No.(s): AD-A385793; Rept-2-5-30911; ARO-39347.1-PH-RIP; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

An advanced program in Computational Physics can conduct research III students in broad areas of physics and computational technology, and be responsive to needs of the Department of Defense. The first serves the Departmental mission, the second gives the preparation for careers in physics or in informational technology (IT), and the third advances our military preparedness. We note that the IT sector currently has approximately one million unfilled opportunities in the USA. Three areas of computationally based research have been selected with these criteria. They are: (1) power compression technology, specifically the study of ultrahigh (approximately equal 10(exp 21) W/cu cm) power densities, (2) basic physical interactions, which has potential applications to navigation and code-breaking, and (3) protein dynamics, an area related to new potentialities in defense against biological attack. The computational equipment associated with this program have yielded results on: (A) the stability of self-trapped plasma channels produced with intense femtosecond ultraviolet (248 mm) pulses, (B) the mechanism of gamma-ray bursts, (C) the fusion of the concepts of mass and space, and (D) the potential existence of a new organizing-principle in biology that has a direct physical counterpart in the group structure of elementary particle states.
DTIC
Chemical Warfare; Physics; Information Systems; Instruments; Plasmas (Physics)

20010021384 Oregon Univ., Dept. of Physics, Eugene, OR USA
High Resolution Optical Spectroscopy of Single Quantum Dots and Cavity-QED Effects and Lasing in Quantum Dot Microdisk Resonator Structures ***Final Report, 1 Jun. 1996 - 30 Nov. 2000***
Sercel, Peter C.; Dec. 12, 2000; 7p; In English
Contract(s)/Grant(s): DAAH04-96-1-0091
Report No.(s): AD-A385798; Rept-00/01; ARO-35230.10-PH-YIP; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project was initiated to study quantum electrodynamic effects (QED) on the interaction between quantum dots and the electromagnetic field. Investigations of quantized matter-field interactions involving self-assembled quantum dots required an advance in the understanding of the electronic structure and optical properties of strained quantum dots. Consequently much of the research carried out under this grant centered on clarifying these issues. Problems investigated included: optimization of the growth process by which the quantum dots were formed; physical characterization of the microstructure of the quantum dots so as to identify their symmetries and to enable the creation of appropriate electronic structure models; the use of these results to calculate electronic structure; and spectroscopic tests of the models.
DTIC
Quantum Electrodynamics; Quantum Dots; Optical Properties; Spectroscopy; Lasing; Microstructure; Electronic Structure

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20010019869 Logistics Management Inst., McLean, VA USA
Best Practices in Facility Management ***Final Report***
Neve, Trevor L., Logistics Management Inst., USA; Selman, John R., Logistics Management Inst., USA; September 1999; 24p; In English
Report No.(s): AD-A385500; LMI-IR914T1; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Benchmark data have been instrumental in helping several defense and civil agency organizations establish performance baselines, identify gaps, and work more effectively and efficiently and less expensively. They serve a larger goal in helping public-

sector organizations discover the possibilities outside their own walls and, ultimately, make more efficient use of our taxpayer dollars. While the Logistics Management Institute's benchmark database has served as a cornerstone in helping to initiate change, data and metrics go only so far in implementing better ways of doing business. They serve as indicators of where additional analysis is needed to explain why costs are out of line with typical costs of similar organizations. Sometimes, the explanations lie in special government needs, regulations, or special environments, but often they lie in processes, management concepts, and even corporate cultures. This report therefore identifies common factors that lie behind the low benchmarked costs of excellent companies. to address this issue has meant turning from metrics to processes to provide insight into achieving best-in-class performance. The report focuses on the processes that will benefit organizations that are looking to make fundamental facility management improvements in the coming years.
DTIC
Logistics Management; Facilities; Performance

20010019990 NASA Goddard Space Flight Center, Greenbelt, MD USA
Endpoint Security Using Biometric Authentication for Secure Remote Mission Operations
Donohue, John T., NASA Goddard Space Flight Center, USA; Critchfield, Anna R., Computer Sciences Corp., USA; Nov. 13, 2000; 2p; In English; Space Internet Workshop, 13-16 Nov. 2000, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We propose a flexible security authentication solution for the spacecraft end-user, which will allow the user to interact over Internet with the spacecraft, its instruments, or with the ground segment from anywhere, anytime based on the user's pre-defined set of privileges. This package includes biometrics authentication products, such as face, voice or fingerprint recognition, authentication services and procedures, such as: user registration and verification over the Internet and user database maintenance, with a configurable schema of spacecraft users' privileges. This fast and reliable user authentication mechanism will become an integral part of end-to-end ground-to-space secure Internet communications and migration from current practice to the future. All modules and services of the proposed package are commercially available and built to the NIST BioAPI standard, which facilitates "pluggability" and interoperability.
Author
Data Bases; Computer Information Security; Space Communication

20010020270 US Arctic Research Commission, Arlington, VA USA
USA Arctic Research Commission, Report on Goals and Priorities for Arctic Research, 1999
1999; 48p; In English
Report No.(s): PB2001-102317; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Arctic remains one of the least explored, studied and understood places on Earth. The perpetual ice cover over much of the Arctic Ocean, the rigorous climate on land and sea and the resulting difficulties, not only in carrying on research but in simple survival, all lead to the current state of relative ignorance about Arctic processes and problems. Political changes in Russia have surpassed in depth and speed all previous forecasts, and the resulting decline in military tension between the two superpowers has converted the Arctic from a region of confrontation into a circumpolar region of cooperation. This new opportunity has also brought to light new dangers in the Arctic, particularly along the shores of the Arctic Ocean. The Arctic Ocean receives about 10% of all the river runoff in the world but contains only 5% of the area and 1.5% of the volume of the world ocean. Much of the river drainage of the former Soviet Union flows into the Arctic Ocean over the vast Russian continental shelf. The results of decades of industrial development, military activities, natural resource development and nuclear power operations have left a substantial, largely uncontrolled and generally unassessed legacy of contaminants in close communication with the Arctic Ocean with the potential to be transported into the Arctic domain with very little warning or opportunity for remediation. Once again, the rigors of working in the Arctic Region make the necessary studies of this potentially serious situation substantially more difficult than their temperate or tropical equivalents.
NTIS
Arctic Regions; Research Projects; Earth Resources

20010020397 NASA Marshall Space Flight Center, Huntsville, AL USA
Beyond Coordination: Joint Planning and Program Execution. The IHPRPT Materials Working Group
Stropki, Michael A., Air Force Research Lab., USA; Cleyrat, Danial A., Anteon Corp., USA; Clinton, Raymond G., Jr., NASA Marshall Space Flight Center, USA; [2000]; 8p; In English; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

”Partnership is more than just coordination,” stated then-Commander of the Air Force Research Laboratory (AFRL), Major General Dick Paul (USAF-Ret), at this year’s National Space and Missile Materials Symposium. His comment referred to the example of the joint planning and program execution provided by the Integrated High Payoff Rocket Propulsion Technology (IHPRPT) Materials Working Group (IMWG). Most people agree that fiscal pressures imposed by shrinking budgets have made it extremely difficult to build upon our existing technical capabilities. In times of sufficient budgets, building advanced systems poses no major difficulties. However, with today’s budgets, realizing enhanced capabilities and developing advanced systems often comes at an unaffordable cost. Overcoming this problem represents both a challenge and an opportunity to develop new business practices that allow us to develop advanced technologies within the restrictions imposed by current funding levels. Coordination of technology developments between different government agencies and organizations is a valuable tool for technology transfer. However, rarely do the newly developed technologies have direct applicability to other ongoing programs. Technology requirements are typically determined up-front during the program planning stage so that schedule risk can be minimized. The problem with this process is that the costs associated with the technology development are often borne by a single program. Additionally, the potential exists for duplication of technical effort. Changing this paradigm is a difficult process but one that can be extremely worthwhile should the right opportunity arise. The IMWG is one such example where NASA, the DoD, and industry have developed joint requirements that are intended to satisfy multiple program needs. More than mere coordination, the organizations comprising the group come together as partners, sharing information and resources, proceeding from a joint roadmap.
Derived from text
Project Planning; Missiles; Conferences

20010020458 Air War Coll., Maxwell AFB, AL USA
Growing the Space Industrial Base: Policy Pitfalls and Prospects
Butterworth, Robert L., Air War Coll., USA; September 2000; 36p; In English
Report No.(s): AD-A383943; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Defense Department has long hoped that its needs for space products and services could be supplied by an industrial base that is sustained by commercial sales. That day has not yet arrived, despite years of targeted purchases, investments, and acquisition reform. The beacons of the past decade’s policy--competition and technology investment--cannot bring it to pass. A more promising approach is found in a strategic outlook on research, development, and procurement. Such an approach probably cannot be sustained, but working toward it would reduce the incidence of counter-productive policies. Future programs are likely to achieve innovation and cost control in the same way that past programs did--through active government participation and managed competition.
Author
Competition; Financial Management; Policies; Management Systems

20010020858 Naval Postgraduate School, Monterey, CA USA
Refining a Task-Execution Time Prediction Model for Use in MSHN
Shaeffer, Bianca A., Naval Postgraduate School, USA; March 2000; 94p; In English
Report No.(s): AD-A378655; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

Nowadays, it is common to see the use of a network of machines to distribute the workload and to share information between machines. In these distributed systems, the scheduling of resources to applications may be accomplished by a Resource Management System (RMS). In order to come up with a good schedule for a set of applications to be distributed among a set of machines, the scheduler within an RMS uses a model to predict the execution time of the applications. A model from a previous thesis was analyzed and refined to estimate the time that the last task will be completed when scheduling several tasks among several machines. The goal of this thesis was to refine the model in such a way that is correctly predicted the execution time of the schedules while doing so in an efficient manner. The validation of the model demonstrated that it could accurately predict the relative execution time of a communication-intensive, asynchronous application, and of certain compute-intensive, asynchronous applications. However, the level of detail required for this model to predict these execution times is too high, and therefore, inefficient.
DTIC
Management Systems; Mathematical Models; Distributed Processing; Applications Programs (Computers); Scheduling

20010021322 NASA Marshall Space Flight Center, Huntsville, AL USA
Institutionalizing Lessons Learned
McBrayer, Robert O., NASA Marshall Space Flight Center, USA; Thomas, Dale, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 52nd; Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA Integrated Action Team (NIAT) was formed by the NASA Administrator in March 2000. The purpose of this team was to identify the actions that NASA must take to address systemic findings reported in 4 different anomaly investigations. Team membership represented senior managers from all the field centers and NASA Headquarters. NIAT report addressed 165 findings and developed 17 action plans that are described in five themes: people and teams, technology, risk, formulation rigor, and communications. The NIAT actions present a systems solution for strengthening formulation and implementation of programs and improving the environment for their support. NIAT results included: enhancing success by avoiding failures that could have been prevented through good planning and sound practice; ensuring that prudent risks do not compromise safety; and ensuring that mission risks are objectively assessed, appropriately mitigated and consciously accepted by the program team and customers. Definitions of Faster, Better, Cheaper and Success Criteria were also developed and included as part of the NIAT report. As a result of the NIAT report, program and project management process changes were incorporated into NASA's quality system documentation, including NPG 7120.513, "NASA Program and Project Management Processes and Requirements. This paper describes the NIAT results and the resulting updates to NPG 7120.5 that keep this program and project management description a living process. Author

NASA Programs; Project Management

20010021619 General Accounting Office, Resources, Community and Economic Development Div., Washington, DC USA

Federal Research. Guidance for Equipment Acquired under Grants and Cooperative Agreements

Mar. 24, 1999; 16p; In English

Report No.(s): PB2001-102738; GAO/RCED-99-73; B-281935; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

During fiscal year 1997, three agencies-the National Science Foundation (NSF), National Institutes of Health (NIH), and the National Oceanic and Atmospheric Administration (NOAA)-awarded over $12 billion in grants and cooperative agreements to nonprofit scientific organizations or nonprofit institutions of higher education to conduct basic or applied scientific research. These funds included several hundred million dollars for equipment. As requested we: identified the guidance NSF, NIH, and NOAA used to ensure that the recipients of grants and cooperative agreements for scientific research provide management controls over the equipment they acquire with federal funds; and determined if four NSF recipients from the Washington, D.C. area had acquired equipment under 14 awards of varying dollar amounts.

NTIS

Congressional Reports; Education; Research

82
DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

20010019850 General Accounting Office, Accounting and Information Management Div., Washington, DC USA

2000 Census: Update on Daa Capture Operations and System

Sep. 29, 2000; 8p; In English

Report No.(s): AD-A384495; GAO/AIMD-00-324R; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy

Earlier this year the U.S. Census Bureau adopted a two-phase approach to capturing household data for the 2000 decennial census. Under phase one, which the bureau terms first pass, only the data necessary to determine the reapportioning of seats in the House of Representatives, which the bureau calls 100 percent data, are captured. Under the second pass, the remaining data, which the bureau calls sample data, are captured. to implement this two-pass approach, the bureau had to modify one of its key systems, the Data Capture System (DCS) 2000, so that during the first pass only the 100 percent data from the digitally imaged census forms (short and long) would be optically read (and keyed) and so that the long-form images could be written to a mass storage device. At the same time that it has been conducting first-pass operations, the bureau's DCS 2000 development contractor has been creating a modified version of the system so that during second-pass operations the stored long-form images can be retrieved and the sample data can be optically scanned and keyed. We have been reviewing and periodically reporting on 1) the bureau's progress in performing first-pass data capture operations, including the performance of DCS 2000, and 2) the bureau's progress in modifying DCS 2000 to perform planned second-pass data capture operations. This letter provides our findings on both topics. The bureau has made good progress on first-pass data capture operations. The bureau met its milestone for completing its processing of questionnaires that households mailed back and it finished processing of questionnaires completed by enumerators ahead of schedule. In addition, DCS 2000 has exceeded its key performance goals, such as optical character recognition

(OCR) accuracy. n support of first-pass operations. The bureau's contractor responsible for modifying DCS 2000 to support second-pass operations is proceeding slightly ahead of schedule.
DTIC
Census; Data Acquisition; Data Processing

20010019999 NASA Marshall Space Flight Center, Huntsville, AL USA
Preliminary Results from Coordinated UVCS-CDS-Ulysses Observations
Parenti, S., NASA Marshall Space Flight Center, USA; Bromage, B. J., NASA Marshall Space Flight Center, USA; Poletto, G., NASA Marshall Space Flight Center, USA; Suess, S. T., NASA Marshall Space Flight Center, USA; Raymond, J. C., NASA Marshall Space Flight Center, USA; Noci, G., NASA Marshall Space Flight Center, USA; Bromage, G. E., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; The Solar and Heliospheric Observatory (SOHO) and the Advanced Composition Explorer (ACE), March 2001, Bern, Switzerland; No Copyright; Avail: Issuing Activity; Abstract Only

The June 2000 quadrature between the Sun, Earth, and Ulysses took place with Ulysses at a distance of 3.35 AU from the Sun and at heliocentric latitude 58.2 deg south, in the southeast quadrant. This provided an opportunity to observe the corona close to the Sun with Coronal Diagnostic Spectrometer (CDS) and Ultraviolet Coronograph Spectrometer (UVCS) and, subsequently, to sample the same plasma when it reached Ulysses. Here we focus on simultaneous observations of UVCS and CDS made on June 12, 13, 16 and 17. The UVCS data were acquired at heliocentric altitudes ranging from 1.6 to 2.2 solar radii, using different grating positions, in order to get a wide wavelength range. CDS data consisted of Normal Incidence Spectrometer (NIS) full wavelength rasters of 120" x 150" centered at altitudes up to 1.18 solar radii, together with Grazing Incidence Spectrometer (GIS) 4" x 4" rasters within the same field of view, out to 1.2 solar radii. The radial direction to Ulysses passed through a high latitude streamer, throughout the 4 days of observations, Analysis of the spectra taken by UVCS shows a variation of the element abundances in the streamer over our observing interval: however, because the observations were in slightly different parts of the streamer on different days, the variation could be ascribed either to a temporal or spatial effect. The oxygen abundance, however, seems to increase at the edge of the streamer, as indicated by previous analyses. This suggests the variation may be a function of position within the streamer, rather than a temporal effect. Oxygen abundances measured by SWICS on Ulysses are compared with the CDS and UVCS results to see whether changes measured in situ follow the same pattern.
Author
Spectra; Plasmas (Physics); Sampling

20010020234 National Inst. of Standards and Technology, Gaithersburg, MD USA
Common Biometric Exchange File Format (CBEFF)
Podio, F. L., National Inst. of Standards and Technology, USA; Dunn, J. S., National Security Agency, USA; Reinert, L., National Security Agency, USA; Tilton, C. J., SAFLINK Corp., USA; OGorman, Lawrence, Veridicom, Inc., USA; Jan. 03, 2001; 44p; In English; Prepared in cooperation with Anadac, Inc., Arlington, VA, SAFLINK Corp., Redmond, WA, and Veridicom, Inc., Santa Clara, CA
Report No.(s): PB2001-101938; NISTIR-6529; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Common Biometric Exchange File Format (CBEFE) describes a set of data elements necessary to support biometric technologies in a common way. These data can be placed in a single file used to exchange biometric information between different system components or between systems. The result promotes interoperability of biometric-based application programs and systems developed by different vendors by allowing biometric data interchange. CBEFF's initial conceptual definition was achieved through a series of three Workshops co-sponsored by the National Institute of Standards and Technology and the Biometric Consortium. A Technical Development Team, formed as a result of these Workshops, developed CBEFF, as described in this publication, in coordination with industrial organizations (i.e., the BioAPI Consortium, the X9.F4 Working Group, the International Biometric Industry Association, and the Interfaces Group of TeleTrusT) and end users. CBEFF provides forward compatibility accommodating for technology improvements and allows for new formats to be created.
NTIS
Biometrics; Document Storage; Data Transfer (Computers); Data Flow Analysis

20010020261 Computer Sciences Corp., Lanham, MD USA
File Management In Space
Critchfield, Anna R., Computer Sciences Corp., USA; Zepp, Robert H., Computer Sciences Corp., USA; Nov. 16, 2000; 4p; In English; Space Internet Workshop, 13-16 Nov. 2000, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We propose that the user interact with the spacecraft as if the spacecraft were a file server, so that the user can select and receive data as files in standard formats (e.g., tables or images, such as jpeg) via the Internet. Internet technology will be used end-to-end

from the spacecraft to authorized users, such as the flight operation team, and project scientists. The proposed solution includes a ground system and spacecraft architecture, mission operations scenarios, and an implementation roadmap showing migration from current practice to the future, where distributed users request and receive files of spacecraft data from archives or spacecraft with equal ease. This solution will provide ground support personnel and scientists easy, direct, secure access to their authorized data without cumbersome processing, and can be extended to support autonomous communications with the spacecraft.
Author
File Maintenance (Computers); Flight Operations; Data Acquisition; Communication Networks

20010020344 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Document Classification by Fuzzy Attribute Evaluation, *Apr. 1999-Jan. 2000*
Celmins, Aivars; Dec. 2000; 26p; In English
Contract(s)/Grant(s): Proj-AH44
Report No.(s): AD-A385669; ARL-TR-380; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A technique for classifying objects is proposed that combines classification estimates based on the properties of object attributes. The technique was developed as an aid to classifying captured foreign documents on the battlefield. In this approach, the input information consists of linguistic assessments of the document's classification; these assessments are based on document attributes such as document age, format, and place of discovery. The assessments are modeled as fuzzy sets and combined with the help of a decision function into an output fuzzy set that represents the overall assessment of the document. For a final linguistic classification, the output of the decision function is compared with target classes. The procedure achieves good performance if the decision function is trained on representative sets of classified objects. Although the classification procedure was developed for classification of captured documents, it might be also applied to target recognition from approximate sensor inputs, triage procedures and diagnostics in medical praxis, risk assessments, and similar problems where classification requires the combination of uncertain judgments.
DTIC
Classifications; Fuzzy Sets

20010020438 Defense Systems Management School, Fort Belvoir, VA USA
Program Management 'Tools' Course: Program Manager, Volume 29
Johnson, Collie, Editor, Defense Systems Management School, USA; Blanch, Norene, Editor, Defense Systems Management School, USA; Gasiorek, Sylvia, Editor, Defense Systems Management School, USA; July-August 2000; ISSN 0199-7114; 118p; In English
Report No.(s): AD-A384804; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

In a repeat of last year's record turnout, Claudia Knott, Director of the Joint Electronic Commerce Program Office, welcomed a large, diversified group of government and industry acquisition, contracting, and logistics professionals; information technologists; and senior defense industry and government executives to Electronic Commerce (EC) Day 2000. The one-day event provided government and industry representatives the opportunity to come together to celebrate and embrace this year's theme: 'Department of Defense Business: A Catalyst for Change in a Digital Environment'.
Derived from text
Defense Industry; Electronic Commerce; Project Management

20010020685
Architecture of the unified VME-based data acquisition system for the spectrometers at the IBR-2 reactor
Korobchenko, M. L.; Levchanovskij, F. V.; Prikhod'ko, V. I.; Resaev, V.; Dec. 31, 1998; 15p; In Russian; In English
Report No.(s): DE99-602121; JINR-R-10-97-410; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report contains a brief description of the architecture and technical implementation of unified data acquisition systems for neutron spectrometers at IBR-2. These systems are based on a limited but functionally complete set of identical (from the viewpoint of hardware) VME blocks, in which the distinction in parameters, functional capabilities, encoding, as well as in correction and preliminary data processing procedures are realized by means of micro programs; electronic tables, switches, etc.
NTIS
Data Acquisition; Neutron Spectrometers

20010020687

Hypertext information system on pulsed neutron sources and scientific investigations based on these sources

Litvinenko, E.; Astakhov, Y.; Akishina, E. P.; Semenov, R. N.; Smol'kov, I. S.; Dec. 31, 1998; 11p; In English

Report No.(s): DE99-602100; JINR-E-10-97-406; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The work on the creation of the hypertext information system has been performed on the basis of the web-server of the Frank Laboratory of Neutron Physics, JINR. The initial project proposed the creation of HTML information resources and did not consider the usage of any database for the information management. During the project implementation it became obvious that the system should have well defined structured informational model and it might be helpful to imply the relational database as a part of the system. The ORACLE server at the Laboratory of Computing Techniques and Automation (LCTA) of the JINR has been used for this task. Now we have a set of ORACLE tables designed using CASE tools for the informational model of the system, structured information about neutron sources, neutron instruments, printed publications and URL addresses. We have also the web interface to these tables using free ware gateway ORALINK installed on our Pentium PC with Windows NT and some tools to administer database and view pictures stored in the tables. We took into account NeXuS specifications while tried to design the informational model of the system, and we continue to work on its creation.

NTIS

Information Systems; Data Base Management Systems; Relational Data Bases; Information Management; Neutron Sources

20010020793

Co-ordination of the nuclear reactions data centers. Report on an IAEA advisory group meeting

Pronyaev, V. G.; Schwerer, O.; Jul. 31, 1998; 139p; In e; IAEA advisory group meeting on co-ordination of the nuclear reaction data centers

Report No.(s): DE99-605339; INDC(NDS)-383; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report summarizes the 1998 co-ordination meeting at the IAEA Headquarters in Vienna of the regional, national and specialized nuclear reaction data centers, concerned by the IAEA at two-year intervals. The main topics are: the international exchange of nuclear reaction data by means of the "EXFOR" system, and the further development of this system; the "CINDA" system as an international index and bibliography to neutron reaction data; the sharing of the workload for speedy and reliable nuclear data compilation and data center services; the exchange and documentation of evaluated data libraries in "ENDF" format; the rapid advances of online electronic information technologies, with goal of rendering data center services to data users in IAEA Member States by means of computer retrievals, online services and printed materials. The scope of data covers microscopic cross-sections and related parameters of nuclear reactions induced by neutrons, charged-particles and photons.

NTIS

Information Systems; Libraries; Information Dissemination; Information Retrieval

20010020806 Geological Survey, Washington, DC USA

New Publications of the U.S. Geological Survey (Lists 1098-1100: Publications Issued January-March 2000)

2000; 74p; In English

Report No.(s): PB2001-101460; ISBN-0-607-94509-5; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The US Geological Survey Publications Database includes comprehensive bibliographic information on USGS reports and maps published from 1880 to the present and references for non-USGS publications with USGS authors published from 1983 to date, a total of approximately 110,000 publications.

Author

Bibliographies; Data Bases; Geological Surveys

20010020813

Research report of fiscal 1997: Survey on information networks for environment technology transfer

Mar. 31, 1998; 106p; In Japanese

Report No.(s): DE99-714233; NEDO-GET-9720; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

ICETT is one of the member organizations of APEC environment technology virtual center which established in Osaka in 1996 for active environment technology exchange between APEC countries based on a survey result obtained in fiscal 1995. ICETT began its information service in April, 1997, and completed useful prototype home pages which include the database composed of practical useful information on environment preservation technology of domestic factories and offices, and training information and local governments' approach cases to pollution control. In fiscal 1997, further survey was made, and the simulation software of a model process was also developed for training. Clean technology and energy saving technology strongly demanded by developing countries were surveyed to prepare a database including useful information for developing countries.

A basic design software for bio-treatment of waste water was also prepared. The total number of home page accesses exceeded a predicted number for the first half year.
NTIS
Environmental Engineering; Technology Transfer; Information Dissemination; Clean Energy; Energy Technology; Environmental Quality

20010021099
selected articles from 1997 issues of ”boletin iie”
IIE Bulletin; Dec. 31, 1997; Volume 21; 165p; In Spanish; In English
Report No.(s): DE98-775140; ETDE-MX-98775140; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Boletin IIE, produced by the Instituto de Investigaciones Electricas, is issued six times a year. Separate citations and abstracts have been prepared for individual articles in scope for the database.
NTIS
Data Bases; Information Systems

20010021192 Lembaga Penerbangan dan Antariksa Nasional, Main Computer Unit, Jakarta, Indonesia
Designing a Surface Atmosphere and Upper Atmosphere Research Data Base Using a Normalization Process ***Perancangan Basis Data Penelitian Atmosfer Permukaan Dan Atmosfer Atas Dengan Menggunakan Proses Normalisasi***
Elyyani, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; July 2000; ISSN 0126-9754; Volume 2, No. 3, pp. 93-100; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The increasing amount of data on surface and upper atmosphere and number of users and researches means it is important to reorganize the data storage, which up to now is not well organized. to prevent problems, the data needs to be collected, centralized, and integrated. Therefore a database is designed by using relational model. to avoid redundancy of the tables, we use a normalization process. In the relational model, the relation among tables uses relation key that will be primary key to each table. Designing those tables begins with First Normal Form, until the most optimal format is determined, in order to avoid redudancy and inconsistency in the data.
Author
Data Bases; Data Storage; Information Systems; Information Resources Management

20010021284 Texas Univ., Construction Research Inst., Austin, TX USA
Impacts of Design/Information Technology on Project Outcomes
Thomas, Stephen R., Texas Univ., USA; January 2000; 52p; In English
Contract(s)/Grant(s): NIST-43NANB813178
Report No.(s): PB2000-101952; NIST-GCR-99-786; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This study sponsored by the National Institute of Standards and Technology (NIST) represents a collaborative effort by industry, government, and academia to evaluate the use of design/information technology (B/IT) and to relate the degree of use to project performance. The study was accomplished by the Construction Industry Institute (CII) staff using data from its Benchmarking and Metrics (BM&M) database and feedback from on-site interviews with representatives of select high performing projects. The CII database reflects the actual project experiences from more than 700 projects from 64 member companies and organizations. Data in the database has been systematically collected during annual data collection cycles since 1996 to support the benchmarking of construction industry performance norms and to measure the degree of practice use. Only US domestic projects were selected for this study and data were segregated by owners and contractors. Contractor data were further screened by selecting only those projects for which contractors performed both design and construction activities. The study consists of three tasks. The first was a detailed statistical analysis of select projects in the CII database. This analysis produced baseline measures of performance and D/IT use and then established the correlation between these measures to assess the economic value of using the technologies. For the second research task, a set of projects that excelled in the use of D/IT and that scored high on performance measures was identified. These ”exemplary” projects provided a basis for further in-depth analyses through on-site interviews with key project representatives. Common characteristics of these projects were summarized via anecdotal information and included in this report as a set of lessons learned. This report, which synthesizes findings of the statistical analyses and on-sight interviews, is the product of the third study task. The results of this study establish that projects benefit from D/IT use.
NTIS
Information Systems; Construction Industry; Data Bases; Data Integration; Computer Aided Design; Research Projects; Technology Utilization

20010021512 Florida State Univ., School of Information Studies, Tallahassee, FL USA

Public Libraries and the Internet 2000: Summary Findings and Data Tables

Bertot, John Carlo, Florida State Univ., USA; McClure, Charles R., Florida State Univ., USA; Sep. 07, 2000; 28p; In English
Report No.(s): PB2001-102935; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The U.S. National Commission on Libraries and Information Science (NCLIS) commissioned a Public Libraries and the Internet study for the year 2000. This study both updated previous NCLIS-sponsored studies (1994, 1995, 1996, 1997, and 1998) and explored new territory regarding public library involvement with and use of the Internet. In particular, the 2000 Public Libraries and the Internet study sought to: Provide longitudinal data regarding the percentage of public libraries connected to the Internet; provide longitudinal data regarding the percentage of public libraries that provide graphical public access Internet services; provide longitudinal data regarding the speed of library public access Internet services; and explore the funding sources that support public library Internet connectivity and information technology infrastructure development.
NTIS

Internets; Information Systems; Tables (Data); Telecommunication

20010021542 Maribor Univ., Fakulteta za Elektrotehniko, Racunalnistvo in Informatiko, Maribor, Slovenia

Developing Object Wrappers for Legacy Integration in Distributed Object Architecture ***Razvoj Objeknih Ovojev za Integracijo Obstojecih Sistemov v Porazdeljeni Objektni Arhitekturi***

Juric, Matjaz B., Maribor Univ., Slovenia; Rozman, Ivan, Maribor Univ., Slovenia; Beloglavec, Simon, Maribor Univ., Slovenia; Hericko, Marjan, Maribor Univ., Slovenia; Welzer, Tatjana, Maribor Univ., Slovenia; Gyoerkoes, Jozsef, Maribor Univ., Slovenia; Electrotechnical Review; 2000; ISSN 0013-5852; Volume 67, No. 5, pp. 238-245; In Slovene; Copyright; Avail: Issuing Activity

Distributed object L technology is important for building new-generation information systems. It extends object technology with the power of the client/server architecture ability of a new technology to integrate legacy systems is very important for its economic success. The objective of legacy integration is to take advantage of a legacy system's information and code when developing enterprise architectures. Legacy Systems Must be able to cooperate with other legacy and newly developed systems. The main goal of this paper - is to present a method for integrating legacy systems within distributed object architecture. The proposed method is outlined. There are eight general steps required. The steps one, two, three, four- and live have been discussed in previous papers. In this paper we focus on the definition of the interfaces (step six), on choosing the right technology (step seven) and on the actual implementation of the wrappers (step eight). The most important contributions of this paper are a praxis proven method for integrating legacy systems within distributed object architecture, a precisely defined method for implementing object wrappers using distributed object architecture, a decision model for choosing the appropriate architecture, and an evaluation of the most important distributed object architectures and CORBA mplementation. The problem that makes it difficult to reuse legacy systems in a distributed object environment is that legacy applications do not look like distributed objects. The challenge becomes encapsulated applications to collectively, implement reusable virtual distributed objects, where operations of an object type might he implemented by different applications. to encapsulate legacy applications, focus needs to he on the design of object interfaces, rather than on applications. Integration with wrapping makes legacy systems look like distributed objects. Clients can use legacy systems as any other distributed object. Clients do not care and do not have to care whether the object they use is a wrapped legacy application or a new generation system. Integration is also useful for decomposing and decoupling large legacy systems into separate components. Each component can have its own wrapper assuming that the system's are supports it. This allows reusing and upgrading each component independently of others. Dividing legacy systems into components permits conquering them incrementally. The paper defines a wrapping method for bridging the application architecture's abstract interface and legacy systems. On one side, the wrapper presents systems with abstract interfaces. On the other side, the wrapper communicate with legacy systems using their existing facilities. Object wrappers and their abstract interfaces present a system view that is implementation independent. Keeping the abstract interface constant, keeps other systems from being aware change and eliminates the need for modifying these other systems. The paper also answers the question which distributed object model is most suitable for legacy integration. Therefore we have designed a decision model that includes time criteria. We have evaluated the three most important distributed object architectures and have found out that the most suitable for legacy integration is CORBA (Common Object Request Broker Architecture). We have also evaluated four most important CORBA implementations. Legacy systems are important for current business operations and represent assets that businesses can not afford to write off. This paper contributes to the general understanding of legacy integration, gives a solid basis for making a decision about file underlying distributed object architecture and presents a praxis proven wrapping method.
Author

Decomposition; Encapsulating; Architecture (Computers)

Includes: aviation law; space law and policy; international law; international cooperation; and patent policy

20010020170 Agency for International Development, Center for Development Information and Evacuation, Washington, DC USA

Partnering for Results: A User's Guide to Intersectoral Partnering

Charles, Chanya L., Agency for International Development, USA; McNulty, Stephanie, Agency for International Development, USA; Pennell, John A., Agency for International Development, USA; Nov. 1998; 26p; In English

Report No.(s): PB2001-102127; AID-PN-ACD-344; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The handbook is divided into six sections. The first section defines intersectoral partnering and discusses the form and function of intersectoral partnerships. Section two identifies the benefits of forming a partnership and highlights some of the potential results of intersectoral partnership. Section three discusses factors to consider when forming a partnership. The fourth section presents steps for developing partnerships. Section five discusses general challenges to the intersectoral partnering process and specific challenges and opportunities stemming from USAID policies and procedures. The final section highlights key elements and lessons learned from intersectoral partnering. It also discusses the role a USAID mission director could play in the development of a partnership.

NTIS

Handbooks; Trends; International Relations; Foreign Policy

20010020753 State Dept., Washington, DC USA

Summary of the U.S. Department of State Strategic Plan, 2000

2000; 122p; In English

Report No.(s): PB2001-102456; No Copyright; Avail: CASI; A02, Microfiche; A06, Hardcopy

This Strategic Plan outlines the roles and mission of the Department of State in achieving the foreign policy goals of the USA, under the direction of the President and the Secretary of State. It is a companion to the International Affairs Strategic Plan, which articulates the fundamental national interests of the USA in terms of long-range goals to create a more secure, prosperous, and democratic world for the American people. The Department's Strategic Plan also demonstrates that diplomacy has a new definition in the post-Cold War era, and that the strategic goals pursued by the Department and all US diplomatic missions overseas are directly linked to the real-life, daily concerns of the American people. The Strategic Overview outlines trends that have a major, global impact on US foreign policy, and identifies the means by which the USA pursues its objectives. The International Affairs Mission Statement defines core US values and priority interests, establishing strategic goals for national security, economic prosperity, protection of American citizens and border security, law enforcement, democracy, humanitarian assistance, environment, population, and health. The Department of State Mission Statement identifies the core responsibilities and values of State as the lead institution for the conduct of American diplomacy.

NTIS

Foreign Policy; USA; Strategy; Governments

20010021188 Lembaga Penerbangan dan Antariksa Nasional, Technical Matters Research, Jakarta, Indonesia

An Analysis of International Legal Principles Which Might be Applied to the Regulation of Geostationary Orbit (GSO) Use ***Analisis Prinsip-Prinsip Hukum Internasional Yang Mungkin Diterapkan Dalam Pengaturan Penggunaan Geostationary Orbit (GSO)***

Soegiyono, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Mardianis, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; July 2000; ISSN 0126-9754; Volume 2, No. 3, pp. 119-126; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The effectiveness of international law depends on the degree of adherence and obligation of a country to implement it. The degree of a country's adherence to international law is also determined by political endorsement of the problem and the degree of ability a country to confront consequences of its activity against the law. There are several principles of international law that may be implemented to the Geostationary Orbit (GSO), but the implementation of each of the principles has several special characteristics. So that, in choosing the principle to be implemented to the GSO, it requires a deep understanding of the principles.

Author

Geosynchronous Orbits; International Law

88
SPACE AND INFORMATION SCIENCES (GENERAL)

20010020461 Lunar and Planetary Inst., Houston, TX USA
Concepts and Approaches for Mars Exploration, Part 2
Concepts and Approaches for Mars Exploration; July 2000; 152p; In English; Concepts and Approaches for Mars Exploration, 18-20 Jul. 2000, Houston, TX, USA; Sponsored by Lunar and Planetary Inst., USA; See also 20010020462 through 20010020536
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1062-Pt-2; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This volume contains extended abstracts that have been accepted for presentation at the Concepts and Approaches for Mars Exploration (Part 2) workshop, July 18-20, 2000. Logistical, administrative, and publications support were provided by the Publications and Program Services Department of the Lunar and Planetary Institute.
Author
Mars Exploration; Mission Planning; Mars Missions; Conferences; Mars (Planet)

20010021291 Helsinki Univ. of Technology, Lab. of Space Technology, Espoo, Finland
Helsinki University of Technology, Laboratory of Space Technology *Annual Report, 1998*
Hallikainen, Martti, Editor, Helsinki Univ. of Technology, Finland; June 1999; ISSN 0786-8154; 68p; In English
Report No.(s): PB2000-105598; Rept-36; ISBN 951-22-4725-9; Copyright; Avail: National Technical Information Service (NTIS)

The activities of the Laboratory of Space Technology in 1998 are described. The Laboratory is responsible for teaching Space Technology at the University. Two Master of Science in Technology degrees, one Licentiate of Science in Technology degree and one Doctor of Science in Technology degree in Space Technology were awarded in 1998. The main area in research was spaceborne and airborne remote sensing, including instrumentation, data collection and development of geophysical inversion algorithms. Seven projects were funded by the European Commission and European Space Agency. The Laboratory' Skyvan research aircraft was operated in various research projects. The main emphasis in instrument development was in interferometric and polarimetric microwave radiometer techniques. The main applications were forest inventory, snow mapping, sea ice research, water quality monitoring, and atmospheric research.
NTIS
Aeronautical Engineering; Universities; Technology Utilization; Remote Sensing

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ASTRONOMY

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20010020056 NASA Marshall Space Flight Center, Huntsville, AL USA
First Intrinsic Anisotropy Observations With the Cosmic Background Imager
Padin, S., California Inst. of Tech., USA; Cartwright, J. K., California Inst. of Tech., USA; Mason, B. S., California Inst. of Tech., USA; Pearson, T. J., California Inst. of Tech., USA; Readhead, A. C. S., California Inst. of Tech., USA; Shepherd, M. C., California Inst. of Tech., USA; Sievers, J., California Inst. of Tech., USA; Udomprasert, P. S., California Inst. of Tech., USA; Holzapfel, W. L., California Univ., USA; Myers, S. T., National Radio Astronomy Observatory; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We present the first results of observations of the intrinsic anisotropy of the cosmic microwave background radiation with the Cosmic Background Imager from a site at 5080 in altitude in northern Chile. Our observations show a sharp decrease in C_l in the range l = 400 - 1500. Such a decrease in power at high l is one of the fundamental predictions of the standard cosmological model, and these are the first observations which cover a broad enough 1-range to show this decrease in a single experiment. The power, C_l, at l approximately 600 is higher than measured by Boomerang and Maxima, with the differences being significant at the 2.7sigma and 1.9sigma levels, respectively. The C_l we have measured enable us to place limits on the density parameter, Omega(tot) is less than or equal to 0.4 or Omega(tot) is greater than = 0.7 (90% confidence).
Author
Anisotropy; Cosmic Microwave Background Radiation; Cosmology; Radio Astronomy

20010020074 Smithsonian Astrophysical Observatory, Cambridge, MA USA

A General Description and Current Status of Chandra

Tananbaum, Harvey, Smithsonian Astrophysical Observatory, USA; [2001]; 1p; In English; New Century of X-Ray Astronomy, 4-9 Mar. 2001, Yokohama, Japan

Contract(s)/Grant(s): NAS8-39073; No Copyright; Avail: Issuing Activity; Abstract Only

The third of NASA's four Great Observatories, the Chandra X-ray Observatory, was launched aboard the Shuttle Columbia on July 23, 1999. Using an Inertial Upper Stage and an internal propulsion system, Chandra was raised to a highly elliptical orbit ranging from 10,000 km to 140,000 km. After a successful activation of all spacecraft, telescope and science instrument systems, Chandra began observing celestial targets about 18 months ago. From the start, Chandra has provided spectacular images and spectra for essentially all types of astronomical objects including stars, supernova remnants, normal and active galaxies, and clusters of galaxies. High spatial resolution X-ray images and high resolution X-ray spectra continue to provide 'surprises" essentially every day. The current Observatory status and selected science highlights will be presented in this talk.

Author

Spacecraft Instruments; X Ray Telescopes; Spectra; X Ray Astrophysics Facility

20010020221 NASA Marshall Space Flight Center, Huntsville, AL USA

Chandra Space Flight Software: Using Software to Autonomously Operation the Largest and Most Sensitive X-Ray Telescope in the World

Crumbley, Tim, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 52nd; International Astronautical Congress, 1-5 Oct. 2001, Toulouse, France; Sponsored by International Astronautical Federation, Unknown

Contract(s)/Grant(s): NAS8-37710; RTOP 455-40-41; No Copyright; Avail: Issuing Activity; Abstract Only

Chandra is the world's largest and most sensitive X-ray telescope. The Chandra X-ray Observatory is the third in NASA's family of "Great Observatories." The Chandra X-ray Observatory, launched by Space Shuttle Columbia on July 23, 1999, is NASA's newest Great Observatory. The Chandra space flight software is the operational software, which controls and directs the Chandra X-ray Observatory. The Chandra flight software has executed faultlessly for over 13,000 hours on-orbit. The Chandra flight software directly controls the Pointing, Aspect Determination, Electrical Power Subsystem, Propulsion system, and the Command, Communications, and Data Management subsystems. The software controls the spacecraft operations during all phases of the mission. The software also performs thermal control of the telescope to maintain pointing accuracy and monitors radiation levels throughout the orbit so that the Science Instruments can be safed if radiation thresholds are exceeded. The efficient operation of Chandra flight software has enabled the gathering of crucial science data. The Chandra flight software fault protection is the key to early detection and prevention of science instrument or spacecraft damage in an operating platform/environment, which is completely unforgiving. Permanently open Sun Shade Door and ACIS focal plane radiator sensitivity exposes science instruments and mirrors to damage for pointing anomalies causing an attitude excursion. The Chandra flight software must prevent these attitude excursions from occurring for ANY failure. Another example is that the power system has an unregulated bus, which imposes severe operating requirements on Chandra flight software to control array pointing and battery connection/disconnect using a unique algorithmic and logic approach. The Chandra flight software has enabled a truly autonomous vehicle with greater than 99% of all mission data collected as planned. Less than 15% of spacecraft operations are conducted in view (1 hour out of 8) leading to very extended periods without ground contact. The Chandra flight software implements the flexible mission plan during this out of view period, manages the solid state recorder capacity, controls all pointing and maneuvers, provides fault detection for all satellite subsystems, and initiates communications with the ground at the appropriate time. This paper will describe the software architecture features, key design elements and software testing techniques that have facilitated Chandra's success.

Author

X Ray Astrophysics Facility; X Ray Telescopes; Applications Programs (Computers); Software Development Tools; Program Verification (Computers); Software Engineering

20010020245 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA

Beginning Research with the 1.8-meter Spacewatch Telescope *Final Report*

Gehrels, Tom, Arizona Univ., USA; Lane, Lynn A., Arizona Univ., USA; Feb. 09, 2001; 16p; In English

Contract(s)/Grant(s): NAG5-3938

Report No.(s): FRS-347320; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this grant was to bring the Spacewatch 1.8-m telescope to operational status for research on asteroids and comets. This objective was achieved; first light with the telescope was in May 2000 and since then several tests and demonstrations of the facility's capability to observe Earth-approaching Asteroids (EAs) have been made, including the first observations to be incorporated into a peer-reviewed publication. The Spacewatch 1.8-m telescope will be the largest in the world dedicated full time

to finding and doing astrometry of asteroids and comets. It will be used to search for asteroids and comets anywhere from the space near Earth to regions beyond the orbit of Neptune, and to do astrometry and lightcurves on the fainter of such objects that are already known. Its comparatively large aperture will permit faster discovery of the very small asteroids in Earthlike orbits, such as 1998 KY(sub 26), that are coveted for their accessibility as material resources in space, as well as recovery of EAs on their return apparitions when they tend to be more distant and fainter than they were at the times of their discoveries. It will also tend to find EAs when they do not happen to be close to Earth. Discoveries made under those circumstances allow the objects to be followed for longer intervals, providing better determinations of their orbits during their discovery apparitions. In addition to its size, the 1.8-m Spacewatch telescope will have the unique capability of long strip scanning in any direction, for example along the ecliptic (the plane of the solar system), and along the line of variation of EAs with uncertain orbits that are being targeted for recovery. Author

Apertures; Asteroids; Comets; Cosmic Ray Showers; Telescopes; Performance Tests

20010020257 NASA Marshall Space Flight Center, Huntsville, AL USA

The Chandra X-Ray Observatory

Weisskopf, M. C., NASA Marshall Space Flight Center, USA; [2001]; 5p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Chandra X-Ray Observatory is the X-ray component of NASA's Great observatories which also includes the recently decommissioned Compton Gamma Ray Observatory, the Hubble Space Telescope, and the soon to be launched Space Infra Red Telescope Facility. Chandra is a unique X-ray astronomy facility for high-resolution imaging and for high-resolution spectroscopy. Chandra's performance advantage over other X-ray observatories is analogous to that of the Hubble Space Telescope over ground-based observatories. Chandra is a NASA facility that provides scientific data to the international astronomical community in response to proposals for its use. Data becomes public one year after the observation. The Observatory is the product of the efforts of many commercial, academic, and government organizations in the USA and Europe. NASA's Marshall Space Flight Center (MSFC) manages the Project and provides Project Science; TRW Space and Electronics Group served as prime contractor responsible for providing the spacecraft, the telescope, and assembling and testing the observatory; the Smithsonian Astrophysical Observatory (SAO) provides technical support and is responsible for ground operations.

Derived from text

Gamma Ray Observatory; X Ray Astrophysics Facility; Ground Operational Support System; Imaging Techniques; Telescopes; Spectroscopy

20010020655 NASA Marshall Space Flight Center, Huntsville, AL USA

Properties of the Chandra Sources in M81

Tennant, Allyn F., NASA Marshall Space Flight Center, USA; Wu, Kinwah, NASA Marshall Space Flight Center, USA; Kolodziejczak, Jeffery J., NASA Marshall Space Flight Center, USA; Swartz, Douglas A., NASA Marshall Space Flight Center, USA; Ghosh, Kajal K., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The Chandra X-ray Observatory obtained a 50-ks observation of the central region of M81 using the ACIS-S in imaging mode. The global properties of the 97 x-ray sources detected in the inner 8'.3 x 8'.3 field of M81 are examined. Roughly half the sources are concentrated within the central bulge. The remainder are distributed throughout the disk with the brightest disk sources lying preferentially along spiral arms. The average hardness ratios of both bulge and disk sources are consistent with power law spectra of index F approximates 1.6 indicative of a population of x-ray binaries. A group of much softer sources are also present. The background source- subtracted log(N)-log(S) distribution of the disk follows a power law of index about -0.5 with no change in slope over three decades in flux. The log(N)-log(S) distribution of the bulge follows a similar shape but with a steeper slope above about 4 x 10(exp 37) ergs/s. There is unresolved x-ray flux from the bulge with a radial profile similar to that of the bulge sources. This unresolved flux is softer than the average of the bulge sources and extrapolating the bulge log(N)-log(S) distribution towards weaker sources can only account for 20% of the unresolved flux. No strong time variability was observed for any source with the exception of one bright, soft source.

Author

Galactic Bulge; X Ray Binaries; X Ray Sources; Galaxies; X Ray Astronomy

20010020928 NASA Marshall Space Flight Center, Huntsville, AL USA

Results of a Deep Chandra Observation of the Crab Nebula and Pulsar

Weisskopf, M. C., NASA Marshall Space Flight Center, USA; Becker, W., NASA Marshall Space Flight Center, USA; Elsner, R. F., NASA Marshall Space Flight Center, USA; Juda, M., NASA Marshall Space Flight Center, USA; Kolodziejczak, J., NASA

Marshall Space Flight Center, USA; Murray, S. S., NASA Marshall Space Flight Center, USA; ODell, S., NASA Marshall Space Flight Center, USA; Paerels, F., NASA Marshall Space Flight Center, USA; Shibazaki, N., NASA Marshall Space Flight Center, USA; Swartz, D., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; New Century of X-Ray Astronomy, 6-8 Mar. 2001, Kanagawa, Japan; No Copyright; Avail: Issuing Activity; Abstract Only

The Crab Nebula and pulsar were observed for a total of 150 ksec with the LETG/HRC-S combination aboard the Chandra X-Ray Observatory in 2000, January and February. One of the principal aims of the experiment was to study the emission from the pulsar as a function of pulse phase. Neutron stars are believed to be formed with core temperatures of 10(exp 11) K. As the pulsar is the best studied of the young known neutron stars with an age of only 940 yrs, it should be possible to observe thermal emission from the hot stellar surface which in turn constrains equations of state. The pulsar, on the other hand, is a powerful non-thermal emitter, powering an X-ray bright synchrotron nebula which, in Einstein and ROSAT observations, overshadowed the fainter thermal surface emission. Making use of the high angular resolution provided by Chandra we were able to detect X-rays from the Crab-pulsar at all pulse phases. We discuss whether this detection is indeed of thermal emission or of a faint synchrotron component of the pulsed emission from the magnetosphere. We further comment on dynamical effects observed in the pulsar-wind outflow and the analysis of the LETG spectral data, especially near the oxygen edge.
Author

Crab Nebula; Pulsars; Synchrotrons; Thermal Emission; X Ray Astronomy; Spaceborne Astronomy

20010021169 NASA Marshall Space Flight Center, Huntsville, AL USA

Considerations for a Next Generation GRB Observatory

Fishman, Gerald J., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 6-10 Nov. 2000, Honolulu, HI, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A framework will be described for the planning of a Next Generation Burst Observatory. This Observatory, using Swift as a pathfinder mission, would study early star formation and early galaxy formation at very high redshifts through observations of thousands of GRBs, their afterglows and environments. It is suggested that the international GRB community should begin some initial studies for such an observatory.
Author

Next Generation Space Telescope Project; NASA Space Programs; Gamma Ray Bursts; Gamma Ray Astronomy; Gamma Ray Telescopes; Gamma Ray Observatory; Spaceborne Telescopes

20010021172 NASA Marshall Space Flight Center, Huntsville, AL USA

Future Missions for Gamma-Ray Astronomy

Meegan, Charles, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; 67th, 3 Nov. 2000, Mississippi State Univ., MS, USA; Sponsored by American Physical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Gamma-ray astronomy has made great advances in recent years, due largely to the recently completed 9-year mission of the Compton Gamma Ray Observatory. In this talk I will give an overview of what advances we may expect in the near future, with particular emphasis on earth-orbiting missions scheduled for flight within the next 5 years. Two missions, the High Energy Transient Explorer and Swift, will provide important new information on the sources of gamma-ray bursts. The Gamma-Ray Large Area Space Telescope will investigate high energy emission from a wide variety of sources, including active galaxies and gamma-ray pulsars. The contributions of ground-based and multiwavelength observations will also be addressed.
Author

Mission Planning; Gamma Ray Astronomy; Gamma Ray Bursts; Gamma Ray Telescopes; Gamma Ray Observatory

20010021183 NASA Goddard Space Flight Center, Greenbelt, MD USA

GeV Gamma-Ray Astronomy in the Era of GLAST

Gehrels, Neil, NASA Goddard Space Flight Center, USA; [2000]; 12p; In English; High Energy Gamma-Ray Astronomy, 26-30 Jun. 2000, Heidelberg, Germany; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Gamma Ray Large Area Space Telescope (GLAST) is a high energy astronomy mission planned for launch in 2005. GLAST features two instruments; the Large Area Telescope (LAT) operating from 20 MeV - 300 GeV and the Gamma-ray Burst Monitor (GBM) operating from 10 keV - 25 MeV. GLAST observations will contribute to our understanding of active galactic nuclei and their jets, gamma-ray bursts, extragalactic and galactic diffuse emissions, dark matter, supernova remnants, pulsars, and the unidentified high energy gamma-ray sources. The LAT sensitivity is 4 x 10(exp -9) photons per square centimeter per second (greater than 100 MeV) for a one year all-sky survey, which is a factor of greater than 20 better than CGRO/EGRET. GLAST spectral observations of gamma-ray bursts cover over 6 orders of magnitude in energy thanks to the context observations

of the GBM. The upper end of the LAT energy range merges with the low energy end of ground-based observatories to provide a remarkable new perspective on particle acceleration in the Universe.
Author
Gamma Ray Astronomy; Gamma Ray Telescopes; Gamma Ray Bursts; Gamma Ray Sources (Astronomy)

20010021222 NASA Marshall Space Flight Center, Huntsville, AL USA
Observations with the Chandra X-Ray Observatory: The First Year
Weisskopf, Martin, NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 3 Nov. 2000, Starkville, MS, USA; Sponsored by American Physical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

One year old, the Chandra X-Ray Telescope is uncovering secrets of the most violent and fiery denizens of the universe. Supernova explosions, black holes, colliding galaxies and now comets are standard fare for the Third Great Observatory.
Author
X Ray Telescopes; X Ray Astrophysics Facility

20010021333 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Searching for Black Holes ***Final Report, 1 Apr. 1997 - 30 Sep. 2000***
Garica, M., Smithsonian Astrophysical Observatory, USA; February 2001; 6p; In English
Contract(s)/Grant(s): NAG5-4193; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In 1995 we proposed to carry out ground-based observations in order to securely identify stellar mass black holes in our galaxy. This type 4 proposal under NASA's UV, Visible, and Gravitational Astrophysics program compliments NASA's space-based research by following up black hole candidates found and studied with space-based observatories, in order to determine if they are indeed black holes. While our primary goal is to securely identify black holes by measuring their masses, a secondary goal is identifying unique visible-range signatures for black holes.
Derived from text
Black Holes (Astronomy); Stellar Mass; Astrophysics; X Ray Astronomy; Galaxies

20010021372 California Inst. of Tech., Observational Cosmology, Pasadena, CA USA
Wide-Field Imaging of Galactic Halos with a Near-Infrared Rocket-Borne Telescope ***Final Report***
Lange, Andrew E., California Inst. of Tech., USA; [2000]; 1p; In English
Contract(s)/Grant(s): NAG5-4079; No Copyright; Avail: Issuing Activity; Abstract Only

We successfully completed both of the proposed flights by May of 1998, on schedule and on budget. In both flights the instrument worked flawlessly, achieving sensitivities slightly better than the specification (1 nW/sq m sr per pixel). The payload was recovered with only minor damage after both flights. The results from the first flight, which targeted the nearby edge-on spiral NCG 4565, have been published. Analysis of the data failed to detect any significant emission, from the halo around the galaxy, and set a very stringent 2 sigma lower limit on the M/L ratio of the halo of greater than 260 in solar units. The results from the second flight, which targeted the infamous NGC 5907, have taken longer to analyze because of an offset in the absolute pointing of the payload which broke the symmetry of the scan pattern about the galaxy, thus complicating the analysis, After careful analysis, Caltech graduate student, Sarah Yost, has recovered the full sensitivity of the experiment, setting a 2 sigma lower limit on the M/L ratio of the halo of greater than 280 in solar units. This result rules out the hypothesis that a significant portion of the halo around NGC 5907 is composed of low-mass stars, as previous observations had suggested. NITE probes directly the halo at 10 to 30 kpc from the disk, a region far too dim for other experiments. Our conclusion is that observations of a significant IR signature associated with the halo at less than approximately 5kpc radius where contaminated by tidally disrupted disk population of stars. In order to test the idea that we could study faint surface-brightness fluctuations in the diffuse background using NITE, we have analyzed the data from the 1997 flight which targeted NCG 4565 (this target is in a region of lower stellar confusion than is NGC 5907). We have detected a significant correlation in the noise at zero-lag, with an amplitude that corresponds to brightness fluctuations of 3.04 plus or minus 0.16 nW/sq m sr. This work will be submitted for publication later this year. An important accomplishment of our sub-orbital program is the training graduate students and postdocs who will become future leaders in NASA's space astrophysics program. The PI has mentored 7 scientists that now hold tenure-track faculty positions or the equivalent at NASA research centers.
Author
Imaging Techniques; Galactic Halos; Rocket-Borne Instruments; Near Infrared Radiation; Space Flight; Infrared Telescopes

20010021549 NASA Marshall Space Flight Center, Huntsville, AL USA

Sunyaev - Zel'dovich Effect Imaging of Massive Clusters of Galaxies at Redshift is greater than 0.8

Joy, Marshall, NASA Marshall Space Flight Center, USA; LaRoque, Samuel, NASA Marshall Space Flight Center, USA; Grego, Laura, NASA Marshall Space Flight Center, USA; Carlstrom, John E., NASA Marshall Space Flight Center, USA; Dawson, Kyle, NASA Marshall Space Flight Center, USA; Ebeling, Harald, NASA Marshall Space Flight Center, USA; Holzapfel, William L., NASA Marshall Space Flight Center, USA; Nagai, Daisuke, NASA Marshall Space Flight Center, USA; Reese, Erik D., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We present Sunyaev-Zel'dovich Effect (SZE) imaging observations of three distant (z greater than 0.8) and highly X-ray luminous clusters of galaxies, C1J1226+33, C1J0152-13 and MS1054-03. Two of the clusters, C1J1226+33 and C1J0152-13, were recently discovered in the WARPS X-ray survey. Their high X-ray luminosity suggests they are massive systems and, if confirmed, would provide strong constraints on the cosmological parameters of structure formation models. Our Sunyaev-Zel'dovich Effect data provide confirmation that they are massive clusters similar to the well studied cluster MS1054-03. Assuming the clusters have the same gas mass fraction derived from SZE measurements of eighteen known massive clusters, we are able to infer their mass and electron temperatures from the SZE data. The derived electron temperatures are 10.0, 8.5, and 10.3 KeV, respectively, and we infer total masses of approximately 2 x 10(circumflex) 14 h(circumflex) -l M - sun within a radius of 65" for all three clusters. For C1J0152-13 and MS1054-03 we find good agreement between our SZE derived temperatures and those derived from X-ray spectroscopic measurements. No X-ray derived temperatures are available for C1J1226+33, and thus the SZE data provide the first confirmation that it is indeed a massive system. The demonstrated ability to determine cluster temperatures and masses from SZE observations without access to X-ray data illustrates the power of using deep SZE surveys to probe the distant universe.
Author

Galactic Clusters; Imaging Techniques; Red Shift; X Ray Astronomy; Cosmology

20010021608 Space Telescope Science Inst., Baltimore, MD USA

Hubble Spies Huge Cluster of Stars Formed by Ancient Encounter

Mar. 01, 2001; In English; Videotape: 6 min. 20 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001030025; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

This release marks the beginning of a new outlet for the Space Telescope Science Institute, the 'Hubble Minute'. Hubble Minute is an edited vignette suitable for use in newscasts, magazine shows, and as an interstitial program. The Minute explains how scientists are determining when M82 and M81 collided, and how dating the crash may result in a better understanding of how our own galaxy formed.
Author

Crashes; Galaxies; Star Clusters; Time Measurement

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ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20010019837 NASA Goddard Space Flight Center, Greenbelt, MD USA

On the Contribution of Unresolved Galactic Stars to the Diffuse Soft X-Ray Background

Kuntz, K. D., NASA Goddard Space Flight Center, USA; Snowden, S. L., NASA Goddard Space Flight Center, USA; [2001]; 14p; In English; Copyright; Avail: Issuing Activity

Using stellar luminosity functions derived from Roentgen Satellite (ROSAT) data, the contributions of Galactic stars to the diffuse X-ray background are calculated for ROSAT PSPC pass-bands. The model follows that of Guillout et al. (1996), but uses ROSAT rather than Einstein data to determine the intrinsic luminosity distributions. The model adequately predicts the numbers of stellar sources observed in deep ROSAT surveys. The contribution of unresolved stellar sources to the ROSAT All-Sky Survey at the Galactic poles is 6.59, 4.76, and 4.91 x 10(exp -6) counts per second arcmin(exp -2) in bands R12 (1/4 keV), R45(3/4 keV), and R67(1.5 keV), respectively, which is equivalent to 4.75, 4.82 and 4.63 x 10(exp -13) ergs per square centimeter per second per deg(exp -2). The uncertainty in the normalization could increase these quantities by a factor of approximately 1.6.
Author

Stellar Luminosity; Background Radiation; Diffuse Radiation; X Ray Astronomy; Galaxies

20010019896 Space Telescope Science Inst., USA

Astronomers Ponder Lack of Planets in Globular Cluster

[2000]; In English; Videotape: 7 min. 58 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001026553; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

This videotape has seven segments, discussing and showing the evidence for the proposition that the galactic clusters do not have many planets. Specifically the segments show: (1) Dr. Ron Gilliland discussing the process of looking for ”Hot Jupiters” (i.e., planets about the size of Jupiter, which are hotter than Jupiter) in the globular clusters, (2) a zoom into 47 Tucanae globular cluster, (3) an animation of a planet passing between the host star and the earth with a brightness graph, (4) the same animation as before without the graph, (5) Ron Gilliland of the Space Telescope Science Institute (STScI) discussing possible interpretations of his findings in the 47 Tucanae globular cluster, (6) Ron Gilliland examining the images of 47 Tucanae, and (7) images of 47 Tucanae watching for variations in brightness.

CASI

Galactic Clusters; Star Clusters; Extrasolar Planets; Gas Giant Planets

20010020219 NASA Marshall Space Flight Center, Huntsville, AL USA

Galaxy Cluster Gas Mass Fractions From Sunyaev-Zel’dovich Effect Measurement: Constraints on Omega_M

Grego, Laura, NASA Marshall Space Flight Center, USA; Carlstrom, John E., NASA Marshall Space Flight Center, USA; Reese, Erik D., NASA Marshall Space Flight Center, USA; Holder, Gilbert P., NASA Marshall Space Flight Center, USA; Holzapfel, William L., NASA Marshall Space Flight Center, USA; Joy, Marshall K., NASA Marshall Space Flight Center, USA; Mohr, Joseph J., NASA Marshall Space Flight Center, USA; Patel, Sandeep, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Using sensitive centimeter-wave receivers mounted on the Owens Valley Radio Observatory and Berkeley-Illinois-Maryland-Association millimeter arrays, we have obtained interferometric measurements of the Sunyaev-Zei’dovich (SZ) effect toward massive galaxy clusters. We use the SZ data to determine the pressure distribution of the cluster gas and, in combination with published X-ray temperatures, to infer the gas mass and total gravitational mass of 18 clusters. The gas mass fraction, f~g, is calculated for each cluster, and is extrapolated to the fiducial radius r_{500} using the results of numerical simulations. The mean f_g within r_{500} is 0.081 + 0.009 - 0.011/(h_{100} (statistical uncertainty at 68% confidence level, assuming OmegaM=0.3, OmegaL=0.7). We discuss possible sources of systematic errors in the mean f 9 measurement. We derive an upper limit for OmegaM from this sample under the assumption that the mass composition of clusters within r_{500} reflects the universal mass composition: Omega_M h <Omega_B/f_g.Thegasmassfonosmology through the angular diameter distance and the r_{500} correction factors. For a flat universe (Omegal, = 1 - OmegaM) and h=0.7, we find the measured gas mass fractions are consistent with OmegaM less than 0.40, at 68% confidence. Including estimates of the baryons contained in galaxies and the baryons which failed to become bound during the cluster formation process, we find OmegaM\approximately 0.25.

Author

Galactic Clusters; Sunyaev-Zeldovich Effect; Cosmic Gases

20010020220 NASA Marshall Space Flight Center, Huntsville, AL USA

A Preliminary Detection of Arcminute Scale Cosmic Microwave Background Anisotropy with the BIMA Array

Dawson, K. S., NASA Marshall Space Flight Center, USA; Holzapfel, W. L., NASA Marshall Space Flight Center, USA; Carlstrom, J. E., NASA Marshall Space Flight Center, USA; Joy, M., NASA Marshall Space Flight Center, USA; LaRoque, S. J., NASA Marshall Space Flight Center, USA; Reese, E. D., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We have used the Berkeley-Illinois-Maryland-Association (BIMA) array outfitted with sensitive cm-wave receivers to expand our search for minute scale anisotropy of the Cosmic Microwave Background (CMB). The interferometer was placed in a compact configuration to obtain high brightness sensitivity on arcminute scales over its 6.6’ FWHM field of view. The sensitivity of this experiment to flat band power peaks at a multipole of 1 = 5530 which corresponds to an angular scale of -2’. We present the analysis of a total of 470 hours of on-source integration time on eleven independent fields which were selected based on their low IR contrast and lack of bright radio sources. Applying a Bayesian analysis to the visibility data, we find CMB anisotropy flat band power Q_flat = 6.1(+2.8/-4.8) microKelvin at 68% confidence. The confidence of a nonzero signal is 76% and we find an upper limit of Q_flat is less than 12.4 microKelvin at 95% confidence. We have supplemented our BIMA observations with concurrent observations at 4.8 GHz with the VLA to search for and remove point sources. We find the point sources make an insignificant contribution to the observed anisotropy.

Author

Cosmic Microwave Background Radiation; Radio Astronomy; Very Large Array (VLA)

20010020225 NASA Marshall Space Flight Center, Huntsville, AL USA

Hard X-Ray Lightcurves of High Mass X-Ray Binaries

Laycock, S., Southampton Univ., UK; Coe, M. J., Southampton Univ., UK; Harmon, B. A., NASA Marshall Space Flight Center, USA; Finger, M., NASA Marshall Space Flight Center, USA; Wilson-Hodge, C., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Copyright; Avail: Issuing Activity; Abstract Only

Using the 7.2 years of continuous data now available from the Burst And Transient Source Experiment (BATSE) aboard CGRO, we have measured orbital periods and produced folded lightcurves for 8 High Mass X-ray Binaries (HMXB). Given the length of the datasets, our determinations are based on many more binary orbits than previous investigations. Thus our source detections have high statistical significance and we are able to follow long-term trends in X-ray output. In particular we focus on two systems: A0538-668 and EXO2030+375 both HMXBs exhibiting Type I outbursts. Recent work on A0538-668 (Alcock et al 1999) reported a 16.65d optical variability due to the orbital period, but only seen during minima of a longer-term variability at 421d. We searched for this signal in the BATSE dataset using an ephemeris derived from Alcock et al (1999) & Skinner (1982). We found no evidence for such modulation and place an upper limit of 3.0 x 10(exp -3) photon/sq cm.s in the 20-70 keV BATSE energy band , based upon statistical modelling of the signal. EXO2030+375 has exhibited an X-ray active epoch, followed by a quiescent period lasting 2.5yr and since April 1996 has exhibited renewed activity. Previous observations (Reig et a 1998) using RXTE ASM data indicate secondary outbursts occur at apastron passage during the current epoch, but not in the former. We present a lightcurve for the earlier epoch showing convincing evidence for such apastron outbursts. We find apastron outbursts in 3 sources, all having orbital periods greater than 41d. No such signal is conclusively detected in the more rapidly orbiting systems studied.

Author

X Rays; Light Curve; X Ray Binaries; X Ray Astronomy; Gamma Ray Bursts; Pulsars

20010020918 NASA Goddard Space Flight Center, Greenbelt, MD USA

GALSPEC: A Tool for Computing the Spectra of Star-Forming Galaxies of Low Metallicity

Heap, S. R., NASA Goddard Space Flight Center, USA; Hubeny, I., NASA Goddard Space Flight Center, USA; Lanz, T. M., NASA Goddard Space Flight Center, USA; Lindler, D. J., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English, 7-11 Jan. 2001, San Diego, CA, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The far-ultraviolet spectral region is rich in diagnostics of star formation in galaxies; it gives information not only about the star-forming complex, but also about the dust and circumstellar gas. We have therefore developed a tool, called GALSPEC, for computing far-UV spectra of star-forming galaxies. The user controls the process through a graphical user interface (GUI) by specifying the input parameters for the stars, dust, and gas. GALSPEC computes the integrated spectrum of a star-forming complex, given the rate of star formation, metallicity (0.2 Z(sub \odot) or 0.5 Z(sub \odot)), and IMF upper mass limit. to compute the integrated spectrum, GALSPEC makes use of a library of stellar spectra composed of observed spectra from HST and model spectra calculated with the TLUSTY/SYNSPEC program (Hubeny & Lanz 1995). GALSPEC then applies wavelength-dependent extinction according to Calzetti's starburst extinction law. The mechanical luminosity from massive stars and supernovae sweeps up interstellar material thereby forming an expanding shell with a central cavity. GALSPEC computes the absorption spectrum of the shell using the CLOUDSPEC program (Hubeny 2000), a combination of Ferland's CLOUDY program and SYNSPEC.

Author

Far Ultraviolet Radiation; Ultraviolet Spectra; Ultraviolet Emission; Stellar Spectra; Absorption Spectra

20010021126 NASA Goddard Space Flight Center, Greenbelt, MD USA

Gamma Ray Pulsars: Observations

Thompson, David J., NASA Goddard Space Flight Center, USA; [2000]; 12p; In English; High Energy Gamma-Ray Astronomy, 26-30 Jun. 2000, Heidelberg, Germany; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High-energy gamma rays are a valuable tool for studying particle acceleration and radiation in the magnetospheres of energetic pulsars. The six or more pulsars seen by CGRO/EGRET show that: the light curves usually have double-peak structures (suggesting a broad cone of emission); gamma rays are frequently the dominant component of the radiated power; and all the spectra show evidence of a high-energy turnover. Unless a new pulsed component appears at higher energies, progress in gamma-ray pulsar studies will be greatest in the 1-20 GeV range. Ground-based telescopes whose energy ranges extend downward toward 10 GeV should make important measurements of the spectral cutoffs. The Gamma-ray Large Area Space Telescope (GLAST), now in planning for a launch in 2005, will provide a major advance in sensitivity, energy range, and sky coverage.

Author

Gamma Ray Astronomy; Gamma Ray Sources (Astronomy); Space Observations (From Earth); Pulsar Magnetospheres; Astrophysics

20010021127 NASA Goddard Space Flight Center, Greenbelt, MD USA

Gamma-Ray Pulsars: Models and Predictions

Harding Alice K., NASA Goddard Space Flight Center, USA; [2000]; 12p; In English; High Energy Gamma-Ray Astronomy, 26-30 Jun. 2000, Heidelberg, Germany; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Pulsed emission from gamma-ray pulsars originates inside the magnetosphere, from radiation by charged particles accelerated near the magnetic poles or in the outer gaps. In polar cap models, the high energy spectrum is cut off by magnetic pair production above an energy that is, dependent on the local magnetic field strength. While most young pulsars with surface fields in the range B = 10(exp 12) - 10(exp 13) G are expected to have high energy cutoffs around several GeV, the gamma-ray spectra of old pulsars having lower surface fields may extend to 50 GeV. Although the gamma-ray emission of older pulsars is weaker, detecting pulsed emission at high energies from nearby sources would be an important confirmation of polar cap models. Outer gap models predict more gradual high-energy turnovers of the primary curvature emission around 10 GeV, but also predict an inverse Compton component extending to TeV energies. Detection of pulsed TeV emission, which would not survive attenuation at the polar caps, is thus an important test of outer gap models. Next-generation gamma-ray telescopes sensitive to GeV-TeV emission will provide critical tests of pulsar acceleration and emission mechanisms.

Author

Gamma Ray Astronomy; Astronomical Models; Pulsars; Mathematical Models; Emission Spectra

20010021129 NASA Goddard Space Flight Center, Greenbelt, MD USA

Neutrinos from AGN

Kazanas, Demosthenes, NASA Goddard Space Flight Center, USA; [2000]; 12p; In English; High Energy Gamma-Ray Astronomy, 26-30 Jun. 2000, Heidelberg, Germany; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The great penetrating power of neutrinos makes them ideal probe of astrophysical sites and conditions inaccessible to other forms of radiation. These are the centers of stars (collapsing or not) and the centers of Active Galactic Nuclei (AGN). It has been suggested that AGN presented a very promising source of high energy neutrinos, possibly detectable by underwater neutrino detectors. This paper reviews the evolution of ideas concerning the emission of neutrinos from AGN in view of the more recent developments in gamma-ray astronomy and their implications for the neutrino emission from these class of objects.

Author

Active Galactic Nuclei; Astrophysics; Neutrinos; Gamma Ray Astronomy; Astronomical Models

20010021130 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Axisymmetric Pulsar Magnetosphere

Contopoulos, J., Crete Univ., Greece; Kazanas, D., NASA Goddard Space Flight Center, USA; Fendt, C., Astrophysikalisches Inst., Germany; [2000]; 4p; In English; High Energy Gamma-Ray Astronomy, 26-30 Jun. 2000, Heidelberg, Germany; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We present the structure of the axisymmetric force-free magnetosphere of an aligned rotating magnetic dipole, in the case in which there exists a sufficiently large charge density (whose origin we do not question) to satisfy the ideal MHD condition, E (raised dot) B = 0, everywhere. The unique distribution of electric current along the open magnetic field lines which is required for the solution to be continuous and smooth is obtained numerically. We expect that our solution will be useful as the starting point for detailed studies of pulsar magnetospheres under more general conditions, namely when either the force-free and/or the ideal MHD condition E (raised dot) B = 0 are not valid in the entire magnetosphere. Based on our solution, we consider that the most likely positions of such an occurrence are the polar cap, the crossings of the zero space charge surface by open field lines, and the return current boundary, but not the light cylinder.

Author

Pulsar Magnetospheres; Symmetry; Force-Free Magnetic Fields; Magnetohydrodynamics; Astrophysics; Mathematical Models

20010021131 NASA Goddard Space Flight Center, Greenbelt, MD USA

Could the Unidentified EGRET Sources in the Gould Belt be of Pulsar Origin?

Zhang, Bing, NASA Goddard Space Flight Center, USA; Harding, Alice K., NASA Goddard Space Flight Center, USA; [2000]; 4p; In English; High Energy Gamma-Ray Astronomy, 26-30 Jun. 2000, Heidelberg, Germany; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We explore the possibility, within the polar cap model, that at least some of the recently identified new population of Energetic Gamma-Ray Experiment Telescope (EGRET) sources in the Gould Belt sources are gamma-ray pulsars, viewed at large angles to the magnetic axis, such that the line-of-sight misses both the bright gamma-ray double cone and the radio beam. We estimate that the detectability of such off-beam gamma-ray sources is about a factor of 4-5 times higher than that of the on-beam sources.

The off-beam gamma-ray pulsars also have a faint, soft nature, which is consistent with the observed properties of the Gould Belt sources. We conclude that at least some of the middle latitude sources might be such off-beam gamma-ray pulsars if they are indeed in the Gould Belt.
Author
Gamma Ray Observatory; Gamma Ray Telescopes; Point Sources; Astrophysics; Pulsars

20010021168 NASA Marshall Space Flight Center, Huntsville, AL USA
A Workshop on High Energy Astrophysical for Amateur Astronomers
Fishman, Gerald J., NASA Marshall Space Flight Center, USA; Mattei, J. A., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English, 6-10 Nov. 2000, Honolulu, HI, USA; Sponsored by American Astronomical Society, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Amateur astronomers are, in general, an enthusiastic and dynamic group of individuals who can help greatly in astronomy public outreach and education programs. In the U.S., they outnumber professional astronomers by over a factor of ten. Over eighty amateur astronomers from all over the U.S. and abroad attended a unique workshop in Huntsville, Alabama in April of this year. Most attendees were provided with travel grants under the condition that they disseminate knowledge gained at the workshop to civic groups, astronomy clubs and science teacher groups in their home communities. Twelve lecturers were given over two days, primarily by active high-energy researchers from NASA-MSFC and NASA-GSFC. Funding for the workshop was provided by a variety of NASA-sponsored projects, offices within OSS and private funding sources. The workshop attendees were selected by the AAVSO, which also administered the funding for the workshop. This high-leverage educational and public outreach program was deemed to be highly successful and bodes well for similar, future workshops. Many of the participants have already begun to give public talks on HEA and GRBs.
Author
Astrophysics; Education

20010021178 NASA Marshall Space Flight Center, Huntsville, AL USA
Evidence for a Sudden Magnetic Field Reconfiguration in SGR 1900+14
Woods, Peter M., NASA Marshall Space Flight Center, USA; Kouveliotou, Chryssa, NASA Marshall Space Flight Center, USA; Gogus, Ersin, NASA Marshall Space Flight Center, USA; Finger, Mark H., NASA Marshall Space Flight Center, USA; Swank, Jean, NASA Goddard Space Flight Center, USA; Smith, Don A., Massachusetts Inst. of Tech., USA; Hurley, Kevin, California Univ., USA; Thompson, Christopher, Canadian Inst. for Theoretical Astrophysics, Canada; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

We report on the detection of large flux changes in the persistent X-ray flux of SGR 1900+14 during its burst active episode in 1998. Most notably, we find a factor of approximately 700 increase in the non-burst X-ray flux following the August 27th flare that decayed in time as a power-law. Throughout the decay of this flux enhancement, our measurements indicate that the pulse fraction remains constant. This indicates a global flux enhancement as a consequence of the August 27th flare rather than localized heating. While the persistent flux has since recovered to the pre-outburst level, the pulse profile has not. The pulse shape changed to a near sinusoidal profile within the tail of the August 27th flare (in gamma-rays) and this effect has persisted for more than 1.5 years (in X-rays). The results presented here suggest the magnetic field of the neutron star in SGR 1900+14 was significantly altered (perhaps globally) during the giant flare of August 27.
Author
Magnetic Fields; X Rays; Pulsars; Radiation Sources

20010021228 NASA Marshall Space Flight Center, Huntsville, AL USA
The Fall 2000 and Fall 2001 SOHO-Ulysses Quadratures
Suess, S. T., NASA Marshall Space Flight Center, USA; Poletto, G., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 34th; ESLAB Symposium, 1 Feb. 2001, Nordwijk, Netherlands; Sponsored by European Space Agency, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

SOHO-Ulysses quadrature occurs when the SOHO-Sun-Ulysses included angle is 90 degrees. It is only at such times that the same plasma leaving the Sun in the direction of Ulysses can first be remotely analyzed with SOHO instruments and then later be sampled in situ by Ulysses instruments. The quadratures in December 2000 and 2001 are of special significance because Ulysses will be near the south and north heliographic poles, respectively, and the solar cycle will be near sunspot maximum. Quadrature geometry is sometimes confusing and observations are influenced by solar rotation. The Fall 2000 and 2001 quadratures are more complex than usual because Ulysses is not in a true polar orbit and the orbital speed of Ulysses about the Sun is becoming comparable to the speed of SOHO about the Sun. In 2000 Ulysses will always be slightly behind the pole but will appear to hang

over the pole for over two months because it is moving around the Sun in the same direction as SOHO. In 2001 Ulysses will be slightly in front of the pole so that its footpoint will be directly observable. Detailed plots will be shown of the relative positions of SOHO and Ulysses will their relative positions. In neither case is true quadrature actually achieved, but this works to the observers advantage in 2001.
Author
Ulysses Mission; SOHO Mission; Quadratures

20010021399 California Univ., Berkeley, CA USA
Scalings and Asymptotics of Coherent Vortices in Protoplanetary Disks
Barranco, J., California Univ., USA; Marcus, P., California Univ., USA; Umurhan, O. M., Stanford Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 85-95; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Gas that is transported radially inward from the outer edge of an accretion disk and onto a forming central star must be in a nearly Keplerian orbit at all radii. to do this, it must give up part of its angular momentum and energy to the ambient gas, which in turn advects angular momentum outward via a secondary flow. Here, we set up the numerical calculation for computing this flow by obtaining simplified sets of 3D, asymptotic equations that are well-posed and can be computed by the same techniques that are used for the 3D, anelastic Euler equation. The asymptotics allow an easy parameterization of the unknown equations of energy and state and boundary conditions. It is shown analytically that the required mass and angular momentum transport cannot occur if the protoplanetary disk is barotropic. However, a small baroclinicity allows it. Scale analysis shows that if 20% of the protoplanetary disk is filled with vortices, then the required transport can occur with a large enough radially inward mass flux to satisfy the astronomical observations.
Author
Accretion Disks; Protoplanets; Vortices; Asymptotic Methods; Euler Equations of Motion; Scaling Laws

20010021400 California Univ., Berkeley, CA USA
Vortices in Protoplanetary Disks and the Formation of Planetesimals
Barranco, J. A., California Univ., USA; Marcus, P. S., California Univ., USA; Studying Turbulence Using Numerical Simulation Databases, 8. Proceedings of the 2000 Summer Program; November 2000, pp. 97-108; In English; See also 20010021392; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The least understood step in the formation of planets is the creation of kilometer size planetesimals from centimeter-size dust grains. It has been suggested that vortices within the protoplanetary disk may concentrate dust particles at their centers, which may enhance the dust density enough to trigger a gravitational instability to clumping. Our companion paper in this volume discusses the fluid dynamics of 3D vortices in a protoplanetary disk. Here, we present preliminary calculations of the motion of dust grains within such 3D vortices. We confirm that grains are focused toward the centers of vortices, and offer a simple physical picture as to why heavy particles are not centrifuged out.
Author
Gravitational Instability; Planetary Evolution; Protoplanets; Agglomeration

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LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20010020462 NASA Glenn Research Center, Cleveland, OH USA
Mars Exploration with a Self-Refueling Hopper
Landis, Geoffrey A., Ohio Aerospace Inst., USA; Linne, Diane, NASA Glenn Research Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 187-188; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

A small reusable 'hopper' vehicle, the Mars In-situ Propellants Rocket (MIPR), is proposed to fly autonomously on Mars, using in-situ propellant production to manufacture rocket propellant directly out of the Martian atmosphere. The MIPR explores the Martian surface under rocket power and can repeatedly takeoff and land, carrying a suite of science instruments over a range of hundreds of meters per hop. The flight demonstration will accomplish a range of technology objectives important to both unmanned probes and to future human missions, including: (1) demonstration of a sub-orbital Mars launch vehicle, (2) demonstra-

tion of a pressure-fed small propulsion system for Mars ascent vehicles, (3) demonstration of a lightweight space engine, and (4) use for the first time of propellants manufactured in-situ on another planetary body. In addition to these technology objectives, the MIPR vehicle can carry a science payload that will advance our understanding of the surface and atmosphere of Mars.
Author
Mars Exploration; Flight Tests; Hoppers; Launch Vehicles; Mars Atmosphere; Mars Missions

20010020463 NASA Glenn Research Center, Cleveland, OH USA
Mate and Dart: An Instrument Package for Characterizing Solar Energy and Atmospheric Dust on Mars
Landis, Geoffrey A., Ohio Aerospace Inst., USA; Jenkins, Phillip, Ohio Aerospace Inst., USA; Scheiman, David, Ohio Aerospace Inst., USA; Baraona, Cosmo, NASA Glenn Research Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 189-190; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The MATE (Mars Array Technology Experiment) and DART (Dust Accumulation and Removal Test) instruments were developed to fly as part of the Mars ISPP Precursor (MIP) experiment on the (now postponed) Mars-2001 Surveyor Lander. MATE characterizes the solar energy reaching the surface of Mars, and measures the performance and degradation of solar cells under Martian conditions. DART characterizes the dust environment of Mars, measures the effect of settled dust on solar arrays, and investigates methods to mitigate power loss due to dust accumulation.
Author
Mars Missions; Mars (Planet); Dust; Instrument Packages; Solar Energy; Environment Effects

20010020464 Northwestern Univ., Dept. of Civil Engineering, Evanston, IL USA
Anaerobic Nitrogen Fixers on Mars
Lewis, B. G., Northwestern Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 191-192; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The conversion of atmospheric nitrogen gas to the protein of living systems is an amazing process of nature. The first step in the process is biological nitrogen fixation, the transformation of N2 to NH3. The phenomenon is crucial for feeding the billions of our species on Earth. On Mars, the same process may allow us to discover how life can adapt to a hostile environment, and render it habitable. Hostile environments also exist on Earth. For example, nothing grows in coal refuse piles due to the oxidation of pyrite and marcasite to sulfuric acid. Yet, when the acidity is neutralized, alfalfa and soybean plants develop root nodules typical of symbiotic nitrogen fixation with Rhizobium species possibly living in the pyritic material. When split open, these nodules exhibited the pinkish color of leghemoglobin, a protein in the nodule protecting the active nitrogen-fixing enzyme nitrogenase against the toxic effects of oxygen. Although we have not yet obtained direct evidence of nitrogenase activity in these nodules (reduction of acetylene to ethylene, for example), these findings suggested the possibility that nitrogen fixation was taking place in this hostile, non-soil material. This immediately raises the possibility that freeliving anaerobic bacteria which fix atmospheric nitrogen on Earth, could do the same on Mars.
Author
Mars (Planet); Exobiology; Extraterrestrial Life; Mars Atmosphere; Nitrogenation

20010020465 NASA Ames Research Center, Moffett Field, CA USA
A Remote Sensing/Geographic Information Systems Approach in the Selection of Mars Sites of Biological Interest
Lobitz, B. M., Johnson Controls World Services, USA; Wood, B. L., NASA Ames Research Center, USA; Averner, M., NASA Ames Research Center, USA; McKay, C., NASA Ames Research Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 193; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The search for extinct or extant life on Mars is the search for past or present liquid water, respectively. There are numerous signs of past liquid water on Mars in the form of dry river valleys, paleolakes, and their associated flow and sediment patterns. While some of these features are recent (Amazonian, 1.8 billion years ago to present), there is no evidence that any are currently flowing. Liquid water on the surface would only be possible at those sites with sufficiently high temperatures and pressure. The key to the selection of sites on Mars to search for evidence of life is the search for the presence of water. An approach to this problem is the use of remotely sensed data incorporated in a geographic information system (GIS). A GIS is a computer-based system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e., data identified according to their locations. In planetary studies these data are acquired from remote sensing (RS) platforms (orbiters). These data are co-registered layers and, through the use of GIS analysis functions, areas on these layers can be selected as a function of the information

desired. Our work used existing data layers from the Viking and Mars Global Surveyor missions to determine where water could be possible in liquid form on the Martian surface, based on the phase diagram for water.
Author
Mars (Planet); Mars Surface; Water

20010020466 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Deep Internal Structure of Mars and the Geophysical Package of Netlander
Lognonne, P., Institut de Physique du Globe, France; Giardini, D., Eidgenoessische Technische Hochschule, Switzerland; Banerdt, B., Jet Propulsion Lab., California Inst. of Tech., USA; Dehant, V., Royal Obsevatory of Belgium, Belgium; Barriot, J. P., GRGS, France; Musmann, G., Technische Univ., Germany; Menvielle, M., Centre National de la Recherche Scientifique, France; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 194-195; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Our present understanding of the interior structure of Mars is mostly based on the interpretation of gravity and rotation data, the chemistry of the SNC (shergottites, nakhlites, chassignites) meteoroids, and a comparison with the much better-known interior structure of the Earth. However geophysical information from previous missions have been insufficient to determine the deep internal structure of the planet. Therefore the state and size of the core and the depth and type of mantle discontinuities are unknown. Most previous seismic experiments have indeed failed, either due to a launch failure (as for the Optimism seismometer onboard the small surface stations of Mars 96) or after failure on Mars (as for the Viking 1 seismometer). The remaining Viking 2 seismometer did not produce a convincing marsquake detection, basically due to too strong wind sensitivity and too low resolution in the teleseismic frequency band. After almost a decade of continuous activity and proposals, the first network mission to Mars, NetLander (NL), is expected to be launched between 2005 and 2007. One of the main scientific objectives of this four-lander network mission will be the determination of the internal structure of the planet using a geophysical package. This package will have a seismometer, a magnetometer, and a geodetic experiment, allowing a complementary approach that will yield many new constraints on the mineralogy and temperature of the mantle and core of the planet.
Author
Mars Missions; Mission Planning; Mars Surface; Planetary Structure; Seismology; Geophysics; Mars (Planet)

20010020467 Science Applications International Corp., Center for Intelligent Systems, Littleton, CO USA
Precision Navigation for a Mars Airplane
Lowrie, James W., Science Applications International Corp., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 196-197; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The rough Martian terrain significantly impedes high speed travel by wheeled vehicles and much of it is simply inaccessible given the capability of typical rover designs. Airplanes, however, have much greater range and can provide access to scientifically interesting terrain that is inaccessible to landers and rovers. Moreover, they can provide coverage of a large portion of the surface and return high resolution images and science data not practical from orbiting spacecraft. Precise navigation on Earth requires a constellation of satellites such as GPS (Global Positioning Satellites) or a network of precisely located and calibrated ground beacons, an approach that is impractical for Mars exploration in the near future. In order to realize the benefits of airplane exploration on Mars, a precision navigation system is required. Such a system also provides a high degree of autonomous capability because it enables: (1) Accurate overflight of specifically targeted sites. (2) Hazard avoidance in low altitude flight. (3) The collection of 'focused' science data which reduces overall data volume and supports an optimized data return strategy (4) Accurate spatial and temporal correlation of acquired science data with orbiter observations. (5) A geodetically referenced site survey capability. (6) A soft landing capability by providing in-flight landing site selection and terminal guidance. (7) Return to a base station following flight. (8) Precise placement of science probes and future navigation beacons. SAIC's Center for Intelligent Systems (SAIC-CIS) leverages on experience from unmanned vehicle research to propose a concept for an intelligent landmark navigation system that relies on autonomous real-time recognition of visible surface features during flight.
Author
Mars Missions; Mars Exploration; Mars (Planet); Autonomous Navigation; Aircraft

20010020469 NASA Goddard Space Flight Center, Greenbelt, MD USA
Mitigating Adverse Effects of a Human Mission on Possible Martian Indigenous Ecosystems
Lupisella, M. L., NASA Goddard Space Flight Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 200-201; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Although human beings are, by most standards, the most capable agents to search for and detect extraterrestrial life, we are also potentially the most harmful. While there has been substantial work regarding forward contamination with respect to robotic

missions, the issue of potential adverse effects on possible indigenous Martian ecosystems, such as biological contamination, due to a human mission has remained relatively unexplored and may require our attention now as this presentation will try to demonstrate by exploring some of the relevant scientific questions, mission planning challenges, and policy issues. An informal, high-level mission planning decision tree will be discussed and is included as the next page of this abstract. Some of the questions to be considered are: (1) to what extent could contamination due to a human presence compromise possible indigenous life forms? (2) to what extent can we control contamination? For example, will it be local or global? (3) What are the criteria for assessing the biological status of Mars, both regionally and globally? For example, can we adequately extrapolate from a few strategic missions such as sample return missions? (4) What should our policies be regarding our mission planning and possible interaction with what are likely to be microbial forms of extraterrestrial life? (5) Central to the science and mission planning issues is the role and applicability of terrestrial analogs, such as Lake Vostok for assessing drilling issues, and modeling techniques. Central to many of the policy aspects are scientific value, international law, public concern, and ethics. Exploring this overall issue responsibly requires an examination of all these aspects and how they interrelate. A chart is included, titled 'Mission Planning Decision Tree for Mitigating Adverse Effects to Possible Indigenous Martian Ecosystems due to a Human Mission'. It outlines what questions scientists should ask and answer before sending humans to Mars.
Author
Mars (Planet); Biological Effects; Contamination; Mission Planning; Ecosystems

20010020470 NASA Ames Research Center, Moffett Field, CA USA
Mars Greenhouse Experiment Module: An Experiment to Grow Flowers on Mars
MacCallum, T. K., Paragon Space Development Corp., USA; Poynter, J. E., Paragon Space Development Corp., USA; McKay, C. P., NASA Ames Research Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 202-203; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

NASA has entered a new phase of in-depth exploration of the planets where robotic exploration of the Solar System is focusing on in-situ missions that pave the way for human exploration. Creating a human presence on Mars will require specialized knowledge and experience concerning the Martian environment and validated technologies that will provide life-supporting consumables. An understanding of the response of terrestrial organisms to the Martian environment with respect to potential deleterious effects on crew health and changes to biological processes will be paramount. In response to these challenges an innovative selfcontained flight experiment is proposed, which is designed to assess the biocompatibility of the Martian environment by germinating seeds and following their growth through to flowering. The experiment, dubbed Mars Greenhouse Experiment Module (Mars GEM), will be accomplished in a sealed pressurized growth chamber or 'Mars Greenhouse'. Seeds will be grown in Martian soil and the Mars Greenhouse will provide ultraviolet-radiation protected, thermal-controlled environment for plant growth that actively controls the CO2 (required nutrient) and O2 (generated by the plants) levels in the chamber. The simple, but visually dramatic, demonstration of the potential to grow a plant in a man-made environment on the surface of Mars should establish a strong connection between current robotic missions and future human habitation on Mars.
Author
Mars Surface; Mars (Planet); Activity (Biology); Vegetation Growth; Mars Missions

20010020471 NASA Goddard Space Flight Center, Greenbelt, MD USA
Molecular and Higher Precision Isotopic Measurements of the Mars Atmosphere and Subsurface Volatiles
Mahaffy, P. R., NASA Goddard Space Flight Center, USA; Atreya, S. K., Michigan Univ., USA; Owen, T. C., Hawaii Univ., USA; Niemann, H. B., NASA Goddard Space Flight Center, USA; Jones, J., Jet Propulsion Lab., California Inst. of Tech., USA; Gorevan, S., Honeybee Robotics Ltd., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 204-205; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

In response to the question 'what to do next' at Mars we explore the value of a high precision in situ measurement of isotopic and trace gas constituents in the atmosphere combined with a similar analysis of gas extracted from near surface rocks and soils. The scientific goals are to advance our understanding of the evolution of the Martian atmosphere and to search for fossils of past geochemical conditions. One element of this program that ties directly to the goals of the Astrobiology Program will be a sensitive search for simple or complex organic molecules contained in the atmosphere and in the solid phase. The broad chemical and isotopic analysis planned insures that a highly successful program will be carried out even if no organics are detected. We will demonstrate that the technology to carry out this Program is presently in hand.
Author
Mars Atmosphere; Atmospheric Composition; Exobiology; Mars (Planet); Soils; Mission Planning

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Returned Samples: The Expectations and Implications

Manhes, G., Laboratoire de Geochimie et Cosmochimie, France; Birck, J. L., Laboratoire de Geochimie et Cosmochimie, France; Allegre, C. J., Laboratoire de Geochimie et Cosmochimie, France; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 206-207; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Before the exploration of Mars, the Apollo and Luna programs are the only example of a planetary investigation including a sample return. The context is somewhat different but the scientific logic to get the best knowledge of a planet from the available remote instruments or returned sample, is broadly similar. The purpose of the present paper is to illustrate some constrains of the geological exploration of a planet. Although there has been 30 years that the first moon samples were returned to the earth for study and that there will be around another ten years before the Mars sample return, there is still a number of measurement methods applied on lunar samples within terrestrial labs which have to day no equivalent counterpart in remote operated instruments. This does not mean that there was no progress but that despite the advances in automation and the power increase in computer process control, there are methods which require either large instruments because of the nature of physics or the presence of the human operator because of the complexity of the analytical procedures. This holds for a constant level of investigation capacity which of course is not the case as the evolution of laboratory instruments has also been tremendous over the last decades in mostly two directions: improvement of the potential of existing instruments and the introduction of new instrumentation concepts, e.g. atomic force microscope or Inductively Coupled Plasma Mass Spectrometry (ICPMS). Adaptation of the instruments to unexpected properties, of the sample is also much faster and efficient for the scientific return when samples are already on Earth.
Author

Mars Sample Return Missions; Mars Missions; Mars (Planet); Mission Planning

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Martian Atmosphere Sample Return *DREAM (Dispositif De Retour D'Echantillon D'Atmosphere Martienne)*

Marty, B., Centre National de la Recherche Scientifique, France; Chassefiere, E., Centre d'Etudes Terrestres et Planetaires, France; Agrinier, P., Laboratoire de Physico-chimie des Fluides geologiques, France; Jambon, A., Laboratoire de Physico-chimie des Fluides Geologiques, France; Javoy, M., Laboratoire de Physico-chimie des Fluides Geologiques, France; Lavielle, B., Commissariat a l'Energie Atomique, France; Marti, K., California Univ., USA; Moreira, M., Laboratoire de Geochimie et Cosmochimie, France; Pinti, D., Paris XI Univ., France; Robert, F., National Museum of Natural History, France; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 208; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The elemental and isotopic composition of the Martian atmosphere are poorly known from the analyses of Viking. The similarity between this composition and that of trapped gas inclusions in SNC (shergottites, nakhlites, chassignites) meteorites led to the conclusion that SNC were from Mars and allowed scientists to refine estimates of Mars atmospheric composition. Due to the large uncertainties remaining on the elemental and isotopic compositions of C, O, N and noble gases, extremely important problems concerning the origin and evolution of the Martian hydrosphere and atmosphere as well as for the geodynamical evolution of Mars cannot be resolved with available measurements. Specifically, the following processes require a precise knowledge of the Martian atmospheric composition: (1) Chemical and isotopic zoning in the solar nebula; (2) Accretion processes; (3) degassing of the planetary interior (catastrophic or/and continuous); (4) contributions of chondritic and cometary material; (5) solar wind input; and (6) atmospheric evolution (T. Tauri, thermal, sputtering, impact erosion). Geological features of the presence of liquid water and its present-day absence, the relative abundance of CO2 and N2, the relative abundances of noble gases, isotopic composition of hydrogen, nitrogen, argon and xenon are all puzzling features which would be explained in a comprehensive model.
Author

Mars Atmosphere; Mars (Planet); Mars Sample Return Missions; Mission Planning; Atmospheric Composition

20010020475 Paris VI Univ., Inst. Jacques Monod, France

Samples for Investigations on Past and/or Current Biological Activity on Mars

Maurel, M.-C., Paris VI Univ., France; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 211-212; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Multi-disciplinary groups of biologists emerged in France as a result of two workshops (June 1999 and January 2000) devoted to Mars sample return. The search based on the assumption that key ingredients for life (liquid water and a source of energy) are evidenced on ancient Mars, they are currently developing strategies to detect possible extinct and/or extant life on Mars. We can be sure that biosignatures of life, if there are, will be rare and to confirm this potentially controversial discovery the most sensible idea to address numerous questions is to bring safely to Earth laboratories selected samples from the surface and subsurface of

Mars. It may be essential in order to claim extraordinary scientific conclusions to permit to do new and complete investigations. Most of them will be conducted under quarantine.
Author
Mars (Planet); Mars Sample Return Missions; Extraterrestrial Life; Exobiology

20010020477 Orbital Sciences Corp., Dulles, VA USA
Science-Enabling MicroSpacecraft Constellations for Mars
Mauritz, A., Orbital Sciences Corp., USA; Patel, B., Orbital Sciences Corp., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 215; In English; See also 20010020461; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

By leveraging commercially-developed spacecraft constellation technology, a wide variety of Mars missions can be accomplished ranging from single microspacecraft missions costing less than $50 million to constellations of microspacecraft that provide distributed remote sensing capabilities. Remote sensing missions that require global coverage of Mars can be conducted by constellations of microspacecraft. These microspacecraft provide focused science at low risk. As an additional benefit, these microspacecraft could easily be modified to provide the communication and navigation infrastructure necessary for other complimentary surface science missions. Orbital Sciences Corporation has extensive experience developing and operating microspacecraft constellations. The figures illustrate microspacecraft designs applicable to a wide variety of Mars missions. Based on the highly proven Microstar bus, this spacecraft is capable of dedicated or shared launches on a number of launch vehicles including Pegasus, Taurus, Delta II, Delta III, and Ariane 5. Missions enabled by these microspacecraft include constellation-based scientific remote sensing, communications relay, navigation, and distributed aperture sensing. Additionally, this bus can support singular missions focused on probe delivery, remote sensing, or remote monitoring of, and data collection from land-based elements conducting Mars in situ science. The spacecraft bus utilizes a common set of low mass, low power avionics successfully demonstrated on 38 MicroStar spacecraft currently in operation. by optimizing mechanical designs around specific launch vehicles and payloads, this bus offers a robust means by which to realize many missions. Depending on launch vehicle capability, this bus can support payloads weighing up 70 kg with average payload power requirements in excess of 50W. These proven spacecraft platforms provide an affordable means by which to execute exciting science missions at low risk. A figure is included in the original abstract.
Author
Mars Missions; Mars Exploration; Spacecraft Design; Satellite Constellations

20010020479 Oregon L-5 Society, Mars Instrument and Science Team (MIST), Oregon City, OR USA
Mars Meteor Survey
McGown, R. D., Oregon L-5 Society, USA; Walden, B. E., Oregon L-5 Society, USA; Billings, T. L., Oregon L-5 Society, USA; York, C. L., Oregon L-5 Society, USA; Taylor, A. G., Oregon L-5 Society, USA; Frederick, R. D., Oregon L-5 Society, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 217-218; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

We propose instruments be included on one or more Mars landers to identify and characterize the meteoroid flux at Mars. Mars orbiting spacecraft and ground operations, both manned and unmanned, are vulnerable to meteoroids. There is pure scientific interest in knowing the frequency, intensity, and radiants of martian meteor showers. Being in a different orbit than Earth and closer to the asteroid belt, Mars has unknown cycles and intensities of meteoroid hazards. Knowledge of these hazards can help us manage risk in future missions, particularly extended and crewed missions. to be most effective the detectors should be continuously active, day and night, for as long a period as possible. Detectors that rely on energy intensive transmitters, such as lasers, radio bounce or radar, are therefore less desirable. A staring instrument is preferable to one which must rapidly skew to track a meteor (requiring extra mechanical parts and susceptible to failure), and should be able to detect multiple meteors simultaneously.
Author
Mars (Planet); Mars Environment; Meteoroid Concentration; Meteoroid Hazards; Meteoroid Showers

20010020481 Puerto Rico Univ., Dept. of Physics and Chemistry, Arecibo, Puerto Rico
Planetary Microbial Ecology on Mars: Environmental Biophysics of Martian Microenvironments
Mendez, A., Puerto Rico Univ., Puerto Rico; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 221-222; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Earth's planetary habitable zone, the biosphere, includes parts of the atmosphere, hydrosphere, and lithosphere. Microbial life thrives within this region due to the availability of liquid water, an energy source, nutrients, and the right environment. The field of microbial ecology studies the interactions of microbial life with the environment. There are many models and techniques

within this field that can be extrapolated to understand the possibilities and limitations of microbial life on Mars past or present environments. The objective of this work is to demonstrate the importance of microbial ecology research on future Mars exploration. The biological relevance of the physical microenvironment characterization of Mars is presented.
Author
Biosphere; Mars Environment; Analogies; Extraterrestrial Life; Biophysics; Microbiology

20010020483 NASA Johnson Space Center, Houston, TX USA
The Search for Water and Other Volatiles in Martian Surface Materials: The Thermal Evolved Gas Analyzer (TEGA)
Ming, D. W., NASA Johnson Space Center, USA; Boynton, W. V., Arizona Univ., USA; Musselwhite, D. S., Arizona Univ., USA; Bailey, S. H., Arizona Univ., USA; Bode, R. C., Arizona Univ., USA; Quadlander, G., Arizona Univ., USA; Kerry, K. E., Arizona Univ., USA; Ward, M. G., Arizona Univ., USA; Lorenz, R. D., Arizona Univ., USA; Pathare, A. V., California Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 225-226; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Volatile-bearing minerals and phases (e.g., Fe-oxyhydroxides, phyllosilicates, carbonates, sulfates, palagonites, glasses) may be important components of the Martian regolith. However, essentially no information exists on the mineralogical composition of volatile-bearing phases in the regolith. The Thermal Evolved Gas Analyzer (TEGA), which was part of the Mars Polar Lander payload, was to determine the abundances of two of the most important volatile compounds (i.e., water and carbon dioxide) in the martian soil and to identify the minerals or phases that harbor these volatiles. The TEGA instrument was composed of a differential scanning calorimeter (DSC) interfaced with evolved gas analysis (EGA). The EGA consisted of a Herriott cell of a tunable-diode laser (TDL) spectrometer that determines CO2 and H2O abundances. The sample chamber was to operate at about 100 mbar (-76 torr) with a N2 carrier gas flow of 0.4 sccm. Specifications of TEGA are described in detail elsewhere in this volume.
Author
Mars Surface; Mars (Planet); Regolith; Planetary Geology; Spacecraft Instruments

20010020484 Academy of Sciences (USSR), Inst. for Space Research, Moscow, USSR
Measurements of Water Ice from Martian Orbit and on the Surface
Mitrofanov, Igor G., Academy of Sciences (USSR), USSR; Anfimov, Dmitrij S., Academy of Sciences (USSR), USSR; Handorin, Sergej P., Academy of Sciences (USSR), USSR; Kondabarov, Andrej A., Academy of Sciences (USSR), USSR; Litvak, Maxim L., Academy of Sciences (USSR), USSR; Pikel'ner, Lev B., Joint Inst. for Nuclear Research, USSR; Popov, Yuri P., Joint Inst. for Nuclear Research, USSR; Shvetsov, Valery N., Joint Inst. for Nuclear Research, USSR; Strelkov, Alexander V., Joint Inst. for Nuclear Research, USSR; Tonshev, Alexander K., Academy of Sciences (USSR), USSR; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 227-228; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Cosmic rays are known to produce large number of high-energy neutrons at the Martian surface. These neutrons produce gamma-ray lines from the nucleus either via inelastic scattering (I-type lines), in which they keep their original high energy, or via capturing reactions (C-type lines), in which they are slowed down to epithermal or thermal energies. These lines together with the lines produced by natural decay of K, Th, and U (N-type lines) will be measured by the Gamma-Ray Spectrometer (GRS) with high purity Ge detector. The mapping of these lines will allow the investigators to determine the distribution of the principal minerals globally over the Martian surface, which is one of the primarily goals of the Mars Surveyor Orbiter 2001 mission. The main scientific objectives of Russian High Energy Neutron Detector (HEND) are consistent with this goal. HEND, as a part of GRS facility, will provide the map of high-energy neutron albedo, which will allow (together with the complementary map of low energy neutron albedo from the Neutron Spectrometer (NS)) to distinguish I-type, C-type, and N-type lines among the forest of lines from the GRS.
Author
Mars Surface; Water; Ice; Mars (Planet); Mars Missions; Neutrons; Detection

20010020485 Utah State Univ., Space Dynamics Lab., Logan, UT USA
Designing a Mars Mission that Will Generate Public Excitement and Support: Sample Return Using In Situ Propellant Production
Mueller, P. J., Utah State Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 228a; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Publicly funded space missions (e.g. all NASA missions) must be perceived by the public as worthwhile in order to retain broad support for NASA and a sustainable space program. In addition, if the public finds the missions exciting and even entertaining, then the level of support will be even greater. 'Good Science' alone is not enough to keep the public interested in space. Exam-

ples of missions that generated great public enthusiasm and those which were hardly noticed are given. A Mars sample return mission architecture is proposed which will generate much public interest and also provide solid scientific research.
Author
Mars Sample Return Missions; Public Relations; Mars Missions; Mission Planning

20010020486 Maryland Univ., Dept. of Physics, College Park, MD USA
The Search of Carbonates in Martian Dust
Mukhin, L. M., Maryland Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, pp. 229; In English; See also 20010020461; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The carbonates budget on Mars remains one of the most controversial problems. Although carbonates of different types are generally believed to be present on Mars surface, there are no successful experiments for their indication. Earth-based spectroscopy gives only upper limit (few percent) for calcium carbonate. The Viking experiments were obviously unsuccessful due to low temperature for decomposition of carbonates. Pollak et al. suggested that too high a concentration of carbonates in airborne dust (one to three percent). Meantime the Martian dust should represent the mixture of different minerals formed by wind abrasive. In the first approximation, the mineral composition of the dust should correspond to the average mineral composition of Martian surface. Therefore, the attempt to determine carbonates in samples of the dust from the surface looks promising. For future experiments on the Martian surface, we propose a simple, highly-sensitive method for the determination of the sorbtion-desorbtion processes of carbon dioxide on the particles of Martian regolith as well as the determination of carbonates with a level of sensitivity from 10 to 100 ppb. The so called method of thermostimulated desorbtion will use the measurement of the change in partial pressure of carbon dioxide during the step heating of the sample. The instrument will consist of a dust sampler, a pyrolitical cell with a temperature range from ambient up to 900 to 1000 C. The collection of dust particles should be processed with TV camera control. The total weight of this type of instrument should be no more than 500 g.
Author
Mars Surface; Dust; Mars Missions; Spacecraft Instruments; Carbonates

20010020487 Maryland Univ., Dept. of Physics, College Park, MD USA
Phobos, Deimos Mission
Mukhin, L. M., Maryland Univ., USA; Sagdeev, R., Maryland Univ., USA; Karavasili, K.; Zakharov, A.; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 230-231; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

One of primary goals of the Solar System Exploration Program is to determine how planets and small bodies evolved. Phobos and Deimos from a technical point of view are more accessible as the targets for space exploration than most of the small bodies. There is a need to understand the basic scientific nature of the Martian moons, both as representatives of the family of Small Bodies in the Solar System and as components of the Mars planet system. There are a number of key unresolved scientific problems related to the Mars, Phobos, and Deimos (MPD) system. The main one being the problem of origin and evolution of the MPD system, solution of which requires knowledge of the chemical composition of Martian moons, impact history and surface morphology, internal structure etc. This investigation fits into the Mars Exploration Program, as the moons are part of the entire Mars system. Study of the fundamental physical and chemical state of Phobos and Deimos will provide information required for understanding the origin and evolution of the Martian planetary system. In spite of previous efforts, their composition, internal structure and details of the processes, which produce their surface morphology, are poorly understood. Because of this, the models of their origins are not well constrained. Missions to Phobos and Deimos with the appropriate instrumentation would be capable of addressing the unresolved issues. Thus the main scientific goal of a Phobos/Deimos mission is to study the different characteristics of the Martian satellites, and understand their origin and evolution.
Author
Mars Missions; Deimos; Phobos; Mission Planning; Interplanetary Spacecraft

20010020489 California Inst. of Tech., Pasadena, CA USA
Robotic Outposts: The Missing Link in Mars Exploration Planning
Murray, B., California Inst. of Tech., USA; Friedman, L., Planetary Society, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 234-235; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Mars Exploration is a long-term endeavor, spanning many presidencies, over 15 Congresses. It needs frequent self-renewing milestones and annually affordable budgets, sustained by a widely shared vision of a human future on Mars. However, there is currently no well-defined transition, which can be visualized, from the planned robotic program to an anticipated, but not yet

authorized, program, to achieve the first human presence. The robotic and human programs can be joined physically and geographically through the establishment of one or more Mars Outposts, robotic research sites that become certified and equipped landing sites for subsequent crewed flights. The implementation of such Outposts linking human and robotic exploration would provide major and affordable milestones on the popular road to Mars. It could increase NASA's confidence and innovation in Mars exploration.
Author
Mars Exploration; Mission Planning; Manned Mars Missions; Robotics; Mars Bases

20010020491 Notre Dame Univ., Dept. of Civil Engineering and Geological Sciences, IN USA
Recommendations for Preserving the Integrity of Samples Collected on Mars and Returned to Earth for Analysis
Neal, C. R., Notre Dame Univ., USA; Jolliff, B. L., Washington Univ., USA; Papike, J. J., New Mexico Univ., USA; MacPherson, G., Smithsonian Institution, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 238-239; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

As part of an integrated approach to planetary exploration, samples will ultimately be returned from Mars to Earth for analysis. This will be the next logical step in our exploration of the red planet as we strive to learn more about its evolution and investigate the possible occurrence of life on Mars. NASA's Curation and Analysis Planning Team for Extraterrestrial Materials (CAPTEM) has been studying the preservation issues for returning geological samples from Mars. The overriding goal of these studies has been the preservation of pristine Martian signatures in the returned samples, thus maximizing the scientific value of such missions. Preventing contamination/alteration is particularly critical for chemical, biological, and morphological signatures that are indicative of life, either extinct of extant. Such prevention is required for the short term during collection, transport, and re-entry and impact on Earth, as well as for long term curation. In this presentation, we discuss contamination issues within the framework of an Athena-like sampling mission; however, the concepts may be extrapolated to other plausible sampling scenarios. Issues encompassing preservation from the successful collection, to return to Earth, and curation of martian samples are discussed within this framework. We build upon earlier reports, and complement the recent Mars Sample Handling and Requirements Panel (MSHARP) report by concentrating on the samples themselves. Below is a summary of recommendations made by CAPTEM that will maximize the scientific value of any returned Martian samples. These recommendations are made, for the most part, with consideration of the stringent budgetary constraints that will be part of any sample return mission to Mars. The governing principle behind this study is that any procedure or piece of equipment that can impact (contaminate) the Mars samples during collection, transportation, or curation needs to be fully evaluated through analysis and experimentation prior to implementation by a scientific committee, that has expertise in extraterrestrial sample analysis, curation, and preservation.
Author
Mars (Planet); Mars Surface Samples; Mars Sample Return Missions; Extraterrestrial Life; Preserving

20010020492 California Univ., Space Sciences Lab., Berkeley, CA USA
In-Situ Measurements of Cosmogenic Radionuclides on the Surface of Mars
Nishiizumi, K., California Univ., USA; Reedy, R. C., Los Alamos National Lab., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 240-241; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Cosmogenic nuclides are produced by cosmic-ray nuclear interactions with target nuclei in rocks, soils, ice, and the atmosphere. Cosmogenic nuclides have been widely used for investigation of solar system matter for several decades. Stable nuclides, such as He-1, Ne-21, and Ar-38, are built up over time as the surface is exposed to cosmic rays. The concentrations of cosmogenic radionuclides, such as Be-10 (halflife = 1.5 Myr), Al-26 (0.705 Myr), and C-14 (5,730 yr) also build up with exposure time but reach saturation values after several half-lives. Especially after development of accelerator mass spectrometry (AMS), cosmogenic nuclides in terrestrial samples are routinely used for geomorphic studies such as glaciation, surface erosion, and tectonics, and studies of atmospheric and ocean circulation. Cosmogenic nuclides on Mars will be able to answer questions of exposure ages, erosion rates, tectonic events, and deposition rates of sediments and/or volatiles. The concentrations of cosmogenic stable nuclides gives the integrated exposure time of the rock/mineral, and the activities of radionuclides give recent records for times back as long as a few half-lives.
Author
Mars Surface; Cosmology; Extraterrestrial Matter; Half Life; Radioactive Isotopes

20010020493 Los Alamos National Lab., NM USA

Colliding Beam Fusion Electric Power System for Mars Exploration

O'Toole, Joseph A., Los Alamos National Lab., USA; Wessel, Frank J., California Univ., USA; Rostoker, N., California Univ., USA; Binderbauer, M., California Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 242; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Exploration of Mars, by robotic means and eventually manned exploration, will require significant levels of reliable, high-density electric power. An electric power system based on fusion energy possesses distinct advantages. If developed successfully fusion energy sources would be characterized by high fuel energy density, low system mass, modest fuel requirements, and the abundance of fuel sources throughout the Solar System. NASA plans a FY01 new program start with a goal of realizing a fully operational fusion space propulsion system within 20 years; a similar time frame as envisioned for the MARS Exploration Initiative. The development milestones for a planetary-based power system and space propulsion system are synergistic extensions of our existing efforts to develop an Earth-based energy source. This paper reviews the scientific and technology base for our design and describes options for the use of this technology on a Mars mission.

Author

Mars Missions; Mission Planning; Propulsion; Interplanetary Spacecraft; Spacecraft Power Supplies

20010020494 California Univ., Dept. of Earth and Space Sciences, Los Angeles, CA USA

Mars Exploration Strategies: Forget About Sample Return

Paige, D. A., California Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 243-244; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

During the past months, loss of the Mars Climate Orbiter and Mars Polar Lander spacecraft have received considerable attention. In reality, NASA's toll of lost missions during this period has been much higher due to the cancellation of the Mars 2001 lander mission and the failure to plan a credible Mars sample return mission. NASA has commissioned a number of internal and independent investigations which have focused on the technical and management failures that were responsible for the failures of the '98 missions. However, the even more serious setbacks that the future missions in the Mars Surveyor Program are experiencing have not received the same degree of critical attention. In this paper, I attempt to identify some of the key science strategy issues relating to these problems, and suggest returning to a strategy for Mars exploration that is more closely aligned with reason, risk avoidance, and reality.

Author

Mars Exploration; Mars Missions; Failure; Cancellation; Mission Planning; Losses

20010020495 California Univ., Dept. of Earth and Space Sciences, Los Angeles, CA USA

After the Mars Polar Lander: Where to Next?

Paige, D. A., California Univ., USA; Boynton, W. V., Arizona Univ., USA; Crisp, D., Jet Propulsion Lab., California Inst. of Tech., USA; DeJong, E., Jet Propulsion Lab., California Inst. of Tech., USA; Hansen, C. J., Jet Propulsion Lab., California Inst. of Tech., USA; Harri, A. M., Finnish Meteorological Inst., Finland; Keller, H. U., Max-Planck-Inst. fuer Aeronomie, Germany; Leshin, L. A., Arizona State Univ., USA; May, R. D., Spectrasensors, Inc., USA; Smith, P. H., Arizona Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 245-246; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The recent loss of the Mars Polar Lander (MPL) mission represents a serious setback to Mars science and exploration. Targeted to land on the Martian south polar layered deposits at 76 degrees south latitude and 195 degrees west longitude, it would have been the first mission to study the geology, atmospheric environment, and volatiles at a high-latitude landing site. Since the conception of the MPL mission, a Mars exploration strategy has emerged which focuses on Climate, Resources and Life, with the behavior and history of water as the unifying theme. A successful MPL mission would have made significant contributions towards these goals, particularly in understanding the distribution and behavior of near-surface water, and the nature and climate history of the south polar layered deposits. Unfortunately, due to concerns regarding the design of the MPL spacecraft, the rarity of direct trajectories that enable high-latitude landings, and funding, an exact reflight of MPL is not feasible within the present planning horizon. However, there remains significant interest in recapturing the scientific goals of the MPL mission. The following is a discussion of scientific and strategic issues relevant to planning the next polar lander mission, and beyond.

Author

Mars Exploration; Mission Planning; Mars Missions; Polar Regions; Mars (Planet)

20010020496 NASA Johnson Space Center, Houston, TX USA

Aladdin: Exploration and Sample Return from the Moons of Mars

Pieters, C., Brown Univ., USA; Cheng, A., Johns Hopkins Univ., USA; Clark, B., Lockheed Martin Astronautics, USA; Murchie, S., Johns Hopkins Univ., USA; Mustard, J., Brown Univ., USA; Zolensky, M., NASA Johnson Space Center, USA; Papike, J.; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 247-248; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Aladdin is a remote sensing and sample return mission focused on the two small moons of Mars, Phobos and Deimos. Understanding the moons of Mars will help us to understand the early history of Mars itself. Aladdin's primary objective is to acquire well documented, representative samples from both moons and return them to Earth for detailed analyses. Samples arrive at Earth within three years of launch. Aladdin addresses several of NASA's highest priority science objectives: the origin and evolution of the Martian system (one of two silicate planets with satellites) and the composition and nature of small bodies (the building blocks of the solar system). The Aladdin mission has been selected as a finalist in both the 1997 and 1999 Discovery competitions based on the high quality of science it would accomplish. The equivalent of Aladdin's Phase A development has been successfully completed, yielding a high degree of technical maturity. Aladdin uses an innovative flyby sample acquisition method, which has been validated experimentally and does not require soft landing or anchoring. An initial phasing orbit at Mars reduces mission propulsion requirements, enabling Aladdin to use proven, low-risk chemical propulsion with good mass margin. This phasing orbit is followed by a five month elliptical mission during which there are redundant opportunities for acquisition of samples and characterization of their geologic context using remote sensing. The Aladdin mission is a partnership between Brown University, the Johns Hopkins University Applied Physics Laboratory, Lockheed Martin Astronautics, and NASA Johnson Space Center. Author

Deimos; Phobos; Samples; Flyby Missions; Mission Planning

20010020498 RAND Corp., Santa Monica, CA USA

Adaptivity and the Architecture for a New Mars Exploration Program

Pinder, J. D., RAND Corp., USA; Richardson, M. I., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 251-252; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

In spite of recent failures, the prospects for Mars exploration remain excellent. The motivation for such optimism is, ironically, rooted in cyclical constraints that are unique to this endeavor: (1) steady annual funding of about $200 million; (2) regular launch opportunities every 26 months; (3) four to six years for the entire spacecraft development process; and (4) six to eight years for the science to unfold through instrument conception and design, and then converge through analysis and publication. These stable cycles create an important opportunity to employ an intelligent exploration strategy that is based on interactive adaptation, using past triumphs and failures to shape future missions. This stability, however, also poses a dangerous temptation to take the opposite approach: a static exploration strategy that is focused on a limited let of scientific objectives. Such an approach must, necessarily, rely on a single overarching 'best guess' as to exactly which fixed sequence of missions is the most attractive, based on a host of assumptions about the cost, technical risk, and potential scientific benefits of the options considered. This approach, however, is fundamentally flawed, even when implemented perfectly, because it does not allow lessons learned over time from both successes and failures to be incorporated into subsequent missions.
Author

Mars Exploration; Mars Missions; Mission Planning

20010020500 Honeybee Robotics Ltd., New York, NY USA

Sample Acquisition Systems for Sampling the Surface Down to Ten Meters Below the Surface for Mars Exploration

Rafeek, S., Honeybee Robotics Ltd., USA; Myrick, T. M., Honeybee Robotics Ltd., USA; Gorevan, S. P., Honeybee Robotics Ltd., USA; Kong, K. Y., Honeybee Robotics Ltd., USA; Singh, S., Honeybee Robotics Ltd., USA; Ji, J., Honeybee Robotics Ltd., USA; Batting, C., Honeybee Robotics Ltd., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 255-256; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Mars missions may benefit from sample acquisition systems under development that are capable of acquiring samples from the surface, from a few centimeters below the surface, from one meter below the surface and from ten meters or more below the surface.The Sample Acquisition and Transfer Mechanism (SATM) is a highly developed sampling tool that features interfaces with in-situ science instruments and sample return containers. A prototype SATM has been developed and successfully tested at Honeybee Robotics to demonstrate the performance requirements necessary to meet the ST/4 Champollion mission goals., many of which could be applicable to a Mars sampling mission. The SATM has been designed to: (1) acquire surface samples, samples at 20 centimeters below the surface and samples at one meter (or more) below the surface, without cross contamination. to accom-

modate the different sample volume requirements by each instrument, the SATM is also designed with a sample chamber that can be infinitely adjusted from 0.1 cc to 1.0 cc. A newer version of SATM is being planned for development in FY01 in collaboration with the JPL Exploration Technology program, where the sample volume will be increased to a maximum of 50.0 cc. This new SATM will also be capable of taking a core sample; (2) transport and transfer samples to a microscope/IR spectrometer, chemical analysis ovens, and a sample return container. For the microscope, the SATM features a sapphire window through which the samples in the chamber can be presented for analysis.
Author
Mars Missions; Mars Exploration; Samplers; Mission Planning; Spacecraft Instruments; Mars Surface Samples

20010020502 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The Need for High-Resolution Crustal Magnetic Field Data on Mars
Raymond, C. A., Jet Propulsion Lab., California Inst. of Tech., USA; Russell, C. T., California Univ., USA; Purucker, M. E., Raytheon Information Technology and Scientific Services, USA; Smrekar, S. E., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 259-260; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Magnetometer observations from the Mars Global Surveyor spacecraft (MAG/ER on MGS) have confirmed that Mars does not presently have an internally-generated dipole magnetic field, and have also revealed intense remanent magnetism in the Martian crust. The remanent magnetic anomalies, most prevalent in the southern highlands region, are a record of the past history of the internal Mars dipole field. The MAG/ER data constitute a valuable data set for constraining the early thermal evolution of Mars and the history of the planetary magnetic field. However, the data lack the resolution needed to draw definite conclusions regarding the time history of the field. High-resolution magnetometer observations, obtained at low-altitude, are needed to complement and extend the MGS/ER data set and allow a definitive time history of the internal Mars dynamo to be constructed.
Author
Planetary Magnetic Fields; Mars (Planet); Planetary Crusts; Magnetic Properties

20010020504 California Inst. of Tech., Div. of Geological and Planetary Sciences, Pasadena, CA USA
The 'Why' and the 'What': The Science Focus of the Mars Exploration Program
Richardson, M. I., California Inst. of Tech., USA; Gaidos, E. J., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 263-264; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The high-level scientific goals and themes of the Mars Exploration Program place important requirements on the nature and architecture of the program. Choices at this level impact not only the particular sequence of missions to be flown, but also the program's saleability, the extent to which the planetary science community is engaged in the program, and the ultimate value of the program both to our understanding of Mars and as a survey tool for deciding whether humans should venture there. We briefly review the history of scientific interest in Mars, through to the inception of the Mars Surveyor Program (MSP). While the MSP began as a relatively broad-based investigation of Mars, the excitement surrounding the 'discovery' of life in the Martian meteorite ALH 84001 redirected the program onto a pathway almost singularly focused on searching for fossil (or even extent) life in returned samples. We support the notion that the question of life is the single most important theme in Martian exploration. However, we argue that the approach that has evolved in the MSP--and would govern missions to be flown beyond 2001--is overly focused. This threatens the utility of the program as a means of understanding the cause and context of life's absence or presence. The rush to a yes-or-no answer on life has also placed technical strain on the program, will ultimately disenfranchise a significant fraction of the scientific community, and will seriously limit the ability of the program to 'survey' the planet for future exploration.
Author
Mars Exploration; Mission Planning; Mars Missions; Extraterrestrial Life; Mars Surveyor 98 Program

20010020505 California Inst. of Tech., Div. of Geological and Planetary Sciences, Pasadena, CA USA
A Two-Stream Model for the Mars Exploration Program
Richardson, M. I., California Inst. of Tech., USA; McEwan, I. J., California Univ., USA; Vasavada, A. R., California Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 265-266; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Mars Exploration Program represents an unprecedented opportunity to study and explore a planet and an environment beyond our own. While this opportunity represents the most important development in planetary exploration since the initial robotic survey of the Solar System, it presents organizational and architectural challenges that have simply not been faced in the NASA robotic exploration endeavor to date. These challenges, of flying frequent, probably interrelated, missions to Mars within

a moderate, flat fiscal environment, were responded to in the late 1990's by the Mars Surveyor Program. The architecture that evolved within this program became singularly motivated by the search for life and singularly focused upon a sample return mission (to be executed over many opportunities). The strategy behind this architecture sought to provide a clear rationale, develop common engineering systems, and centrally execute an ambitious technical program. We argue that the singular focus on the search for life and on the highly ambitious sample return strategy, while well motivated in terms of developing program coherence, forced the program into a non-optimal architecture and caused it to over-reach its means. We will argue that the focused and centralized nature of the program seriously limited its ability to respond to failures or successes; overly strained the program by coupling broad constituencies with a highly ambitious technical approach, and ultimately stifled competition, creativity, and responsiveness as the Announcement of Opportunity (AO) system was abandoned in favor of facility development.
Author
Mars Exploration; Mars Sample Return Missions; Mission Planning; Mars Missions; Project Management

20010020509 NASA Johnson Space Center, Houston, TX USA
Common In-Situ Consumable Production Plant for Robotic Mars Exploration
Sanders, G. B., NASA Johnson Space Center, USA; Trevathan, J. R., NASA Johnson Space Center, USA; Peters, T. A., NASA Johnson Space Center, USA; Baird, R. S., NASA Johnson Space Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 273-274; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Utilization of extraterrestrial resources, or In-Situ Resource Utilization (ISRU), is viewed by the Human Exploration and Development of Space (HEDS) Enterprise as an enabling technology for the exploration and commercial development of space. A key subset of ISRU which has significant cost, mass, and risk reduction benefits for robotic and human exploration, and which requires a minimum of infrastructure, is In-Situ Consumable Production (ISCP). ISCP involves acquiring, manufacturing, and storing mission consumables from in situ resources, such as propellants, fuel cell reagents, and gases for crew and life support, inflation, science and pneumatic equipment. One of the four long-term goals for the Space Science Enterprise (SSE) is to 'pursue space science programs that enable and are enabled by future human exploration beyond low-Earth orbit - a goal exploiting the synergy with the human exploration of space'. Adequate power and propulsion capabilities are critical for both robotic and human exploration missions. Minimizing the mass and volume of these systems can reduce mission cost or enhance the mission by enabling the incorporation of new science or mission-relevant equipment. Studies have shown that in-situ production of oxygen and methane propellants can enhance sample return missions by enabling larger samples to be returned to Earth or by performing Direct Earth Return (DER) sample return missions instead of requiring a Mars Orbit Rendezvous (MOR). Recent NASA and Department of Energy (DOE) work on oxygen and hydrocarbon-based fuel cell power systems shows the potential of using fuel cell power systems instead of solar arrays and batteries for future rovers and science equipment. The development and use of a common oxygen/methane ISCP plant for propulsion and power generation can extend and enhance the scientific exploration of Mars while supporting the development and demonstration of critical technologies and systems for the human exploration of Mars.
Author
Mars Sample Return Missions; Mission Planning; Mars (Planet); Mars Exploration; Robotics

20010020510 Detection Limit, Laramie, WY USA
Tools for Robotic In Situ Optical Microscopy and Raman Spectroscopy on Mars
Schoen, C. H., Detection Limit, USA; Dickensheets, D. L., Montana State Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 275-276; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Robotic missions to Mars require remote diagnostic tools for detecting evidence of former life. Laser Raman spectroscopy is eminently suitable for this quest as its light-scattering principle permits nonintrusive analysis. Integration of Raman spectroscopy with optical microscopy correlates biochemical and morphological data. Vibrational Raman spectra identify component moieties of unknown target biomolecules such as pigments involved in photosynthesis and UV-protection. Antarctic desert analoges of potential early Mars habitats support localized anaerobic photosynthetic bacteria and widespread cyanobacteria containing chlorophyll as a primary pigment. Chlorophyll and accessory pigments (e.g. phycocyanin) autofluoresce at visible wavelengths (e.g. 530 nm). Although valuable for epifluorescence microscopy, this interferes with Raman spectra by producing curved baselines and instrument saturation. Fourier Transform Raman spectroscopy (FTRS) with near-IR excitation avoids most fluorescence while producing distinct and unique spectra for a wide range of wavenumbers. These spectra identify key moieties,

such as the porphyrin nucleus of chlorophyll, which can be detected in whole communities from deserts with features common to potential habitats of early Mars.
Author
Mars Missions; Mars (Planet); Extraterrestrial Life; Exobiology; Robotics; Spacecraft Instruments

20010020511 Arkansas Univ., Cosmochemistry Group, Fayetteville, AR USA
Optical Dating of Martian Eolian Sediments by Robotic Spacecraft
Sears, Derek W. G., Arkansas Univ., USA; Lepper, Kenneth, Oklahoma State Univ., USA; McKeever, W. S., Oklahoma State Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 277-278; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Martian polar ice caps record a wealth of information about the past history and climate of Mars, but as pointed out by Clifford et al. in the summary of the First International Conference on Mars Polar Science and Exploration, 'The single greatest obstacle to unlocking and interpreting the geologic and climatic record preserved at the [martian] poles is the need for absolute dating.' Stratification in the polar caps arises, at least in part, from the incorporation of eolian material into the ice, and dune fields near the poles indicate eolian transport is an important surfical process in this region of Mars. Eolian materials are ideally suited for sediment dating using luminescence methods. Luminescence dating techniques have been used successfully to make absolute age determinations for numerous terrestrial Quaternary eolian deposits. Clifford et al. also concluded that cost, simplicity, and potential for minaturization make luminescence dating more feasible than isotopic methods for in situ dating by robotic landers. In fact, the water detection equipment of the Deep Space 2 microprobes and the MECA on the Mars Polar Lander contain components similar to those required for luminescence dating.
Author
Mars (Planet); Mars Environment; Mars Surface; Polar Caps; Time Measurement; Geochronology

20010020512 Washington Univ., Dept. of Earth and Planetary Sciences, Saint Louis, MO USA
Combined Remote Mineralogical and Elemental Measurements from Rovers
Seelos, F. P., Washington Univ., USA; Wiens, R. C., Los Alamos National Lab., USA; Cremers, D. A., Los Alamos National Lab., USA; Ferris, M., Los Alamos National Lab., USA; Blacic, J. D., Los Alamos National Lab., USA; Arvidson, R. E., Washington Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 279-280; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The FIDO/K9 Year 2000 Mars Prototype Rover field trials at the Lunar Crater Volcanic Field, Blackrock Summit, NV provided the opportunity for the tandem acquisition of Laser Induced Breakdown Spectroscopy (LIBS) data and VISIR reflectance data from select geologic targets in a non-laboratory environment. The LIBS data were acquired by the Los Alamos National Laboratory (LANL) LIBS instrument mounted on the Ames Research Center K9 rover, and the VISIR reflectance data were acquired with an ASD Full Range portable spectrometer. The ASD instrument has a wavelength range of 350 to 2500 nm and a spectral resolution of 3 to 10 nm. LIBS is focused on the determination of the elemental composition of a target, whereas VISIR reflection spectroscopy is more useful in inferring the mineralogy. by acquiring both types of data in tandem from rovers, a more complete characterization of the target can be obtained. The samples that were measured in the field are pictured. It should be noted that sample A11/A14 is a single target separated into two pieces. In addition, the reflectance data for sample A04 proved to be unreliable so analyses are not included in this report. These considerations reduce the number of samples in the analysis to ten. Analyses of the reflectance spectra led to the separation of the samples into four distinct groups. These groups are defined as follows: (1) Group 1, Basalt endmember, low and generally featureless reflectance spectra; (2) Group 2, Goethite endmember, characteristic goethite Fe(3+) spectral features in the range of 0.50 to 0.85 microns; (3) Group 3, Kaolinite endmember, diagnostic spectral doublet with minima at 2.17 and 2.21 microns; and (4) Group 4, Dolomite endmember, carbonate feature at 2.32 microns. It should be noted that many of the samples in Group 3 also exhibit the goethite spectral features, and that the lone sample in the dolomite group has a strong kaolinite doublet in its reflectance spectrum as well. A summary of the results of the classification is given, and a graph exhibits representative spectra from each group.
Author
Mars Missions; Prototypes; Chemical Composition; Spacecraft Instruments

20010020513 Jet Propulsion Lab., California Inst. of Tech., USA
The Myths of Mars: Why We're Not There Yet, and How to Get There
Shirley, Donna L., Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 281-282; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

This paper is a controversial look at some of the beliefs (myths) held by the space community which block us from formulating a successful Mars Exploration strategy. The origins and consequences of these myths are presented in contrast with attitudes and actions which would have a better chance of getting us to Mars than we currently have.
Author
Mars Exploration; Mars Missions; Mission Planning; Project Management

20010020516 Arizona Univ., Tucson, AZ USA
The Martian Oasis Detector
Smith, P. H., Arizona Univ., USA; tomasko, M. G., Arizona Univ., USA; McEwen, A., Arizona Univ., USA; Rice, J., Arizona Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 286-287; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The next phase of unmanned Mars missions paves the way for astronauts to land on the surface of Mars. There are lessons to be learned from the unmanned precursor missions to the Moon and the Apollo lunar surface expeditions. These unmanned missions (Ranger, Lunar Orbiter, and Surveyor) provided the following valuable information, useful from both a scientific and engineering perspective, which was required to prepare the way for the manned exploration of the lunar surface: (1) high resolution imagery instrumental to Apollo landing site selection also tremendously advanced the state of Nearside and Farside regional geology; (2) demonstrated precision landing (less than two kilometers from target) and soft landing capability; (3) established that the surface had sufficient bearing strength to support a spacecraft; and (4) examination of the chemical composition and mechanical properties of the surface. The search for extinct or extant life on Mars will follow the water. However, geomorphic studies have shown that Mars has had liquid water on its surface throughout its geologic history. A cornucopia of potential landing sites with water histories (lakes, floodplains, oceans, deltas, hydrothermal regions) presently exist. How will we narrow down site selection and increase the likelihood of finding the signs of life? One way to do this is to identify 'Martian oases.' It is known that the Martian surface is often highly fractured and some areas have karst structures that support underground caves. Much of the water that formed the channels and valley networks is thought to be frozen underground. All that is needed to create the potential for liquid water is a near surface source of heat; recent lava flows and Martian meteorites attest to the potential for volcanic activity. If we can locate even one spot where fracturing, ice, and underground heat are co-located then we have the potential for an oasis. Such a discovery could truly excite the imaginations of both the public and Congress providing an attainable goal for both robotic and manned missions. The instrument required to detect an active oasis is a high spatial resolution (few tens of meters) Short Wavelength Infrared (SWIR) spectrometer coupled with a high resolution camera (five m/pixel). This combination creates too large a data volume to possibly return data for the entire Martian Surface; therefore it has been designed as one of the first in a new generation of 'smart' detectors, called the Mars Oasis Detector (MOD).
Author
Mars (Planet); Water; Mars Missions; Mars Surface; Spacecraft Instruments; Oases; Mars Exploration

20010020517 Laboratoire de Planetologie et Geodynamique, Nantes, France
What Scientific Objectives Have Been Defined by the French Scientific Community for Mars Exploration?
Sotin, Christophe, Laboratoire de Planetologie et Geodynamique, France; Concepts and Approaches for Mars Exploration; July 2000, pp. 288; In English; See also 20010020461; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Every four or five years, the French scientific community is invited by the French space agency (CNES) to define the scientific priorities of the forthcoming years. The last workshop took place in March 98 in Arcachon, France. During this three-day workshop, it was clear that the study of Mars was very attractive for everyone because it is a planet very close to the Earth and its study should allow us to better understand the chemical and physical processes which drive the evolution of a planet by comparing the evolution of the two planets. For example, the study of Mars should help to understand the relationship between mantle convection and plate tectonics, the way magnetic dynamo works, and which conditions allowed life to emerge and evolve on Earth. The Southern Hemisphere of planet Mars is very old and it should have recorded some clues on the planetary evolution during the first billion years, a period for which very little is known for the Earth because both plate tectonics and weathering have erased the geological record. The international scientific community defined the architecture of Mars exploration program more than ten years ago. After the scientific discoveries made (and to come) with orbiters and landers, it appeared obvious that the next steps to be prepared are the delivery of networks on the surface and the study of samples returned from Mars. Scientific objectives related to network science include the determination of the different shells which compose the planet, the search for water in the subsurface, the record of atmospheric parameters both in time and space. Those related to the study of samples include the understanding of the differentiation of the planet and the fate of volatiles (including H2O) thanks to very accurate isotopic measurements which can be performed in laboratories, the search for minerals which can prove that life once existed on Mars, the search for present life

on Mars (bacteria). Viking landers successfully landed on the surface of Mars in the mid seventies. Mars Pathfinder showed that rovers could be delivered at the surface of the planet and move around a lander. If it seems feasible that such a lander can grab samples and return them to the lander, a technical challenge is to launch successfully a rocket from the surface of Mars, put in orbit the samples, collect the sample in orbit and bring them back to the surface of the Earth. Such a technical challenge in addition to the amount of scientific information which will be returned, makes the Mars Sample Return mission a very exciting mission at the turn of the millenium. Following the Arcachon meeting, CNES made the decision to support strongly Mars exploration. This program includes three major aspects: (1) strong participation in the ESA Mars Express mission, (2) development of network science in collaboration with European partners, and (3) participation in the NASA-lead Mars Sample Return mission. In addition, participation in micromissions is foreseen to increase the scientific return with low-cost missions.
Author
Mars (Planet); Mars Exploration; Mars Sample Return Missions; Planetary Evolution; Mission Planning

20010020518 Cornell Univ., Ithaca, NY USA
The Athena Mars Rover Investigation
Squyres, S. W., Cornell Univ., USA; Arvidson, R. E., Cornell Univ., USA; Bell, J. F., III, Cornell Univ., USA; Carr, M., Cornell Univ., USA; Christensen, P., Cornell Univ., USA; DesMarais, D., Cornell Univ., USA; Economou, T., Cornell Univ., USA; Gorevan, S., Cornell Univ., USA; Haskin, L., Cornell Univ., USA; Herkenhoff, K., Cornell Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 289-290; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Mars Surveyor program requires tools for martian surface exploration, including remote sensing, in-situ sensing, and sample collection. The Athena Mars rover payload is a suite of scientific instruments and sample collection tools designed to: (1) Provide color stereo imaging of martian surface environments, and remotely-sensed point discrimination of mineralogical composition; (2) Determine the elemental and mineralogical composition of martian surface materials; (3) Determine the fine-scale textural properties of these materials; and (4) Collect and store samples. The Athena payload is designed to be implemented on a long-range rover such as the one now under consideration for the 2003 Mars opportunity. The payload is at a high state of maturity, and most of the instruments have now been built for flight.
Author
Spacecraft Instruments; Mars Missions; Roving Vehicles; Mars Surface; Payloads; Mission Planning

20010020519 NASA Ames Research Center, Moffett Field, CA USA
In Situ Resource Utilization Technologies for Enhancing and Expanding Mars Scientific and Exploration Missions
Sridhar, K. R., Arizona Univ., USA; Finn, J. E., NASA Ames Research Center, USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 291; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The primary objectives of the Mars exploration program are to collect data for planetary science in a quest to answer questions related to Origins, to search for evidence of extinct and extant life, and to expand the human presence in the solar system. The public and political engagement that is critical for support of a Mars exploration program is based on all of these objectives. In order to retain and to build public and political support, it is important for NASA to have an integrated Mars exploration plan, not separate robotic and human plans that exist in parallel or in sequence. The resolutions stemming from the current architectural review and prioritization of payloads may be pivotal in determining whether NASA will have such a unified plan and retain public support. There are several potential scientific and technological links between the robotic-only missions that have been flown and planned to date, and the combined robotic and human missions that will come in the future. Taking advantage of and leveraging those links are central to the idea of a unified Mars exploration plan. One such link is in situ resource utilization (ISRU) as an enabling technology to provide consumables such as fuels, oxygen, sweep and utility gases from the Mars atmosphere.
Author
Mars Exploration; Mars Missions; Mission Planning; Robotics; Manned Mars Missions

20010020525 Southwest Research Inst., San Antonio, TX USA
Potential Atmospheric and Biomarker Measurements Acquired by In Situ Instrumentation on Mars
Waite, J. H., Southwest Research Inst., USA; Bass, D. S., Southwest Research Inst., USA; Young, D. T., Michigan Univ., USA; Miller, G. P., Southwest Research Inst., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 302-303; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The use of in situ measurements on the Martian surface can greatly improve our ability to select sample return materials with high scientific potential and can be used to study the climate history of Mars. In this paper we discuss the principles of sample preparation, gas chromatography, mass spectrometry, and related techniques that can achieve the measurement objectives

described in a companion abstract. Here we also discuss an investigation we have undertaken in coupling of a mass spectrometer to a differential scanning calorimeter such as that developed by the University of Arizona for the Mars Polar Lander MVACS payload.
Author
Mars Missions; Mars Surface; Climate; Mars Environment; Spacecraft Instruments; Climatology

20010020532 Harvard-Smithsonian Center for Astrophysics, Cambridge, MA USA
The Importance of Bringing Samples of Mars to Earth
Wood, J. A., Harvard-Smithsonian Center for Astrophysics, USA; Boynton, W. V., Arizona Univ., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 316-317; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

A basic goal of the Mars Surveyor Program, begun in 1996, was the delivery to Earth of carefully chosen samples of Mars surface material. Interest generated by the proposition that Mars meteorite ALH84001 displays evidence of extraterrestrial life, also put forward in 1996, intensified interest in the Mars Surveyor Program in general and sample return in particular. As we all know, however, the character of the projected Surveyor program has changed dramatically with the failures of the Mars Climate Orbiter and Mars Polar Lander missions and the realization that ambitious goals must be scaled back. Most notably, the concept of sample return from Mars has all but disappeared from the dialogue about Mars exploration in the next decade. Remote analysis of surface materials by instruments on landed rovers is offered as the next-best option. This paper argues that remote analysis is not even in the same league as the study of samples in terrestrial laboratories, and that every effort should be made to fulfill the goal of sample return at the earliest opportunity. Remote analysis is inferior to laboratory study in two fundamental ways.
Author
Mars Exploration; Mars Surface; Extraterrestrial Life; Exobiology; Mars Sample Return Missions; Mars Missions

20010020533 Jet Propulsion Lab., California Inst. of Tech., USA
Immersive Environment Technologies for Mars Exploration
Wright, John R., Jet Propulsion Lab., California Inst. of Tech., USA; Hartman, Frank, Jet Propulsion Lab., California Inst. of Tech., USA; Concepts and Approaches for Mars Exploration; July 2000, Part 2, pp. 318-319; In English; See also 20010020461; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

JPL's charter includes the unmanned exploration of the Solar System. One of the tools for exploring other planets is the rover as exemplified by Sojourner on the Mars Pathfinder mission. The light speed turnaround time between Earth and the outer planets precludes the use of teleoperated rovers so autonomous operations are built in to the current and upcoming generation devices. As the level of autonomy increases, the mode of operations shifts from low-level specification of activities to a higher-level specification of goals. To support this higher-level activity, it is necessary to provide the operator with an effective understanding of the in-situ environment and also the tools needed to specify the higher-level goals. Immersive environments provide the needed sense of presence to achieve this goal. Use of immersive environments at JPL has two main thrusts that will be discussed in this talk. One is the generation of 3D models of the in-situ environment, in particular the merging of models from different sensors, different modes (orbital, descent, and lander), and even different missions. The other is the use of various tools to visualize the environment within which the rover will be operating to maximize the understanding by the operator. A suite of tools is under development which provide an integrated view into the environment while providing a variety of modes of visualization. This allows the operator to smoothly switch from one mode to another depending on the information and presentation desired.
Author
Spacecraft Instruments; Mission Planning; Unmanned Spacecraft; Space Exploration; Autonomy; Solar System

20010021609 Space Telescope Science Inst., Baltimore, MD USA
Worlds Smaller than Saturn
Mar. 01, 2001; In English; Videotape: 64 min. 7 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2001030026; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

Computerized animations show the following: (1) an artist's conception of a Saturn-like extrasolar planet; (2) star and planet motion; and (3) young stellar disk and planet formation. Footage shows the outside of the Mauna Kea Observatories in Hawaii and Geoff Marcy and Paul Butler inside while they are processing information. Then a press conference,'Worlds Smaller than Saturn', is seen. Anne Kinney, Origins Science Director, NASA Headquarters, introduces Geoff Marcy, Paul Butler, Alan Boss,

and Heidi Hammel. They discuss the discovery of the two new Saturn-sized extrasolar planets that are orbiting the stars HD46375 and 79 Seti, giving details on the search technique and size distribution. They then answer questions from the press.
CASI
Extrasolar Planets; Planetary Evolution

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

20010019889 NASA Marshall Space Flight Center, Huntsville, AL USA
Sigmoid CME Source Regions at The Sun: Some Recent Results
Sterling, Alphonse C., National Academy of Sciences - National Research Council, USA; Journal of Atmospheric and Solar-Terrestrial Physics; 2000; ISSN 1364-6826; Volume 62, pp. 1427-1435; In English; 22nd; 22nd General Assembly of the International Union of Geodesy and Geophysics, Jul. 1999, Birmingham, UK; Sponsored by International Council of Scientific Unions, USA; Original contains color illustrations; Copyright; Avail: Issuing Activity

Identifying coronal mass ejection (CME) precursors in the solar corona would be an important step in space weather forecasting, as well as a vital key to understanding the physics of CMEs. Twisted magnetic field structures are suspected of being the source of at least some CMEs. These features can appear sigmoid (S or inverse-S) shaped in soft X-ray, (SXR) images. We review recent observations of these structures and their relation to CMEs. using SXR data from the Soft X-ray Telescope (SXT) on the Yohkoh satellite, and EUV data from the EUV Imaging Telescope (EIT) on the SOHO satellite. These observations indicate that the pre-eruption sigmoid patterns are more prominent in SXRs than in EUV, and that sigmoid precursors are present in over 50% of CMEs. These findings are important for CME research, and may potentially be a major component to space weather forecasting. So far, however, the studies have been subject to restrictions that will have to be relaxed before sigmoid morphology can be used as a reliable predictive too[. Moreover, some CMEs do not display a SXR sigmoid structure prior to eruption, and some others show no prominent SXR signature of any kind before or during eruption.
Author
Coronal Mass Ejection; Solar Corona; Space Weather; Weather Forecasting

20010020805 National Center for Atmospheric Research, Boulder, CO USA
Effect of a Large-Scale Magnetic Field on Light Element Abundances, Gravity Wave Propagation and Torsional Oscillations Inside the Sun
Barnes, Graham Keith, National Center for Atmospheric Research, USA; January 1999; 180p; In English
Report No.(s): PB2001-101487; Copyright; Avail: Issuing Activity

The presence of a large-scale magnetic field in the interior of solar-mass stars has a number of potential implications for the redistribution of angular momentum; in turn, how angular momentum is redistributed may have observable consequences for surface abundances of certain light elements. A Finite Element Method (FEM) code is used to solve the momentum and induction equations for the angular velocity and the toroidal magnetic field inside the radiative interior of a solar-mass star, assuming a static poloidal magnetic field. The resulting angular velocity profiles are used to construct a turbulent diffusivity with which the transport of Lithium and Beryllium is calculated. It is found that the evolution of the surface abundance of Lithium depends sensitively on the assumed strength and configuration of the poloidal field. Certain configurations and strengths are virtually indistinguishable from purely hydrodynamical models, however, models which produce almost identical Lithium depletion have markedly different Beryllium depletion.
Author
Abundance; Angular Velocity; Beryllium; Depletion; Diffusivity; Lithium; Magnetic Effects

20010021190 Lembaga Penerbangan dan Antariksa Nasional, Solar and Space Environment Ionosphere Research and Development Center, Jakarta, Indonesia

Flare-Producing Solar Active Area Magnetic Field Configurations ***Konfigurasi Medan Magnetik Daerah Aktif Di Matahari Yang Menghasilkan Flare***

Yatini, Clara Yono, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; July 2000; ISSN 0126-9754; Volume 2, No. 3, pp. 108-114; In Malay-Indonesian; Copyright; Avail: Issuing Activity

The goal of this research was to study the magnetic field structure of six active regions and their relations to flare productivity. Three of these active regions produced many flares, both big flares and subflares, while the others did not. According to Somov's Model of Potential Field, we conclude that the configuration of flaring active regions are more complex than the nonflaring ones. Author

Magnetic Field Configurations; Potential Fields; Solar Magnetic Field; Solar Flares

20010021191 Lembaga Penerbangan dan Antariksa Nasional, Atmospheric Environment Observation, Jakarta, Indonesia

An Analysis of the Morphology of Pre- to Post-Flare Sunspot Flare Area Magnetic Field Contours ***Analisis Morfologi Kontur Medan Magnet Daerah Flare Sunspot Pre Sampai Pasca Flare***

Widodo, Nanang, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Setiahadi, Bambang, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Sudardji, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Sodikin, A., Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Marlan, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Aeni, Nur, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Kambry, Maspul Aini, Lembaga Penerbangan dan Antariksa Nasional, Indonesia; Warta LAPAN; July 2000; ISSN 0126-9754; Volume 2, No. 3, pp. 101-107; In Malay-Indonesian; Copyright; Avail: Issuing Activity

Pre-flare conditions are characterized by a strong magnetic field in the active regions compared to that in the surrounding quiet regions. During the active phase, magnetic field (represented in the contour and brightness of magnetogram) around sunspot group shows the dynamics of the sunspots. The measurable parameter of the morphology of magnetic field up to the peak of their activity is the increase of magnetic flux and the spread of the bright region. While during post-flare, magnetogram contours decrease and sunspot groups disappear.

Author

Magnetic Flux; Morphology; Solar Magnetic Field; Sunspots; Magnetic Effects

20010021227 NASA Marshall Space Flight Center, Huntsville, AL USA

Fine Structure in the Corona and Solar Wind at High Heliographic Latitudes at Solar Maximum

Suess, S. T., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 34th; ESLAB Symposium, 1 Feb. 2001, Noordwijk, Netherlands; Sponsored by European Space Agency, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

Microstreams and pressure balance structures in fast solar wind were more easily detected at Ulysses at 2.2 AU over the poles than at Helios at 0.3 AU. This is because solar rotation brings sources of fast solar wind beneath sources of slow solar wind at a rate that depends on latitude, for the same size features. Dynamic interaction between the fast and slow wind tends to mix the flows and make features more difficult to detect with increasing distance from the Sun. A given sized feature takes proportionally longer to pass a longitude when it is at 80 degrees latitude than when it is at the equator. At solar maximum, Ulysses will mainly be sampling solar wind coming from above streamers and from near streamers. The data will provide information on fine structure at the tops of streamers - the stalks - and on the source of slow solar wind. The visibility of the boundaries between fast and slow wind and of the stalk will increase with increasing latitude. I will present quantitative calculations of the visibility of various sized features, with various differences in flow speed, at the location of Ulysses when it is over the south (in 2000) and north (in 2001) polar regions of the Sun.

Author

Fine Structure; Latitude; Solar Wind; Spectroheliographs; Solar Corona; Solar Activity Effects; Polar Regions

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see 52 Aerospace Medicine. For theory see 73 Nuclear Physics.

20010020062 NASA Marshall Space Flight Center, Huntsville, AL USA
The Ever Changing X-ray Sky: X-ray Transients Observed With BATSE
Wilson-Hodge, Colleen A., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English, 11 Jan. 2001, Southampton, UK; No Copyright; Avail: Issuing Activity; Abstract Only

X-ray transients are typically sources in our own galaxy. They are called ”transient” because they usually spend more time in quiescence than in outburst. These transients consist of a compact object and a ”normal” star in a binary system. The compact objects in some of these systems are known to be neutron stars because they exhibit X-ray bursts or periodic pulsations, Other systems are believed to contain black holes based upon their outburst behavior and in some cases, optical measurements of their masses. The Burst and Transient Source Experiment (BATSE), one of 4 instruments on the Compton Gamma Ray Observatory, was an all-sky instrument sensitive to photons from about 20 keV to 2 MeV, designed primarily to detect gamma-ray bursts. Transient and persistent hard X-ray point sources were extracted from the data using the Earth occultation method to measure source intensities. In this method, the change in count rate in a BATSE detector was measured just before and just after a source location was occulted by the Earth. For long period pulsars (>1 second) Fourier transforms and epoch-folded searches were used to measure pulse frequency and pulsed flux. Using these methods, 3 black hole candidates and 6 X-ray pulsars were discovered with BATSE during its 9 years in orbit. BATSE provided unprecedented temporal coverage in the 20 keV - 2 MeV band, allowing detection of numerous new outbursts of X-ray transients. In this talk, I will describe the BATSE instrument, discuss methods we use to detect hard X-ray sources, and describe observations of X-ray transients.
Author
X Ray Sources; X Ray Astronomy; Pulsars; Gamma Ray Observatory; Gamma Ray Bursts

20010020377 Maryland Univ., Faculty of the Graduate School, College Park, MD USA
Small-Scale Spatial Fluctuations in the Soft X-ray Background
Kuntz, K. D., Maryland Univ., USA; 2000; 22p; In English; Copyright; Avail: Issuing Activity

In order to isolate the diffuse extragalactic component of the soft X-ray background, we have used a combination of ROSAT All-Sky Survey and IRAS 100 micrometer data to separate the soft X-ray background into five components: (1) We find a Local Hot Bubble similar to that described by Snowden et al.; (2) We make a first calculation of the contribution by unresolved galactic stars to the diffuse background; (3) We constrain the normalization of the Extragalactic Power Law (the contribution of the unresolved extragalactic point sources such as AGN, QSO’s, and normal galaxies) to 9.5 +/- 0.9 keV/sq cm/s/sr/kEv, assuming a power-law index of 1.46; (4) We show that the remaining emission, which is some combination of galactic halo emission and the putative diffuse extragalactic emission, must be composed of at least two components which we have characterized by thermal spectra. The softer component has logT approx. = 6.08 and a patchy distribution; thus it is most probably part of the Galactic halo. The harder component has log T approx. = 6.46 and is nearly isotropic; some portion may be due to the Galactic halo and some portion may be due to the diffuse extragalactic emission. The maximum upper limit to the strength of the emission by the diffuse extragalactic component is the total of the hard component, approx. 7.4 +/- 1.0 keV/sq cm/s/sr/keV in the 3/4 keV band; (5) We have made the first direct measure of the fluctuations due to the diffuse extragalactic emission in the 1 keV band. Physical arguments suggest that small angular scale (approx. 10 min) fluctuations in the Local Hot Bubble or the Galactic halo will have very short dissipation times (approx. 10(exp 5) years). Therefore, the fluctuation spectrum of the soft X-ray background should measure the distribution of the diffuse extragalactic emission. Using mosaics of deep, overlapping PSPC pointings, we find an autocorrelation function value of approx. 0.0025 for 10 min is less than theta is less than 20 min, and a value consistent with zero on larger scales. Measurement of the fluctuations with a delta-I/I method produces consistent results.
Author
Background Radiation; X Rays; X Ray Astronomy

20010020642
Atmospheric neutrinos at Super-Kamiokande and parametric resonance in neutrino oscillations
Akhmedov, E.; Dighe, A.; Smirnov, A.; Lipari, P.; Aug. 31, 1998; 45p; In English
Report No.(s): DE99-607934; IC-98/98; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We consider the oscillations of atmospheric neutrinos in the earth in the three-neutrino scheme with a (Delta)m(sup 2) hierarchy and a small admixture of the electron neutrino in the heavy mass eigenstate characterized by the mixing angle theta(sub 13).

We show that for (Delta)m(sup 2) (approx-equal) (0.5-3) x 10 (exp -3) eV(sup 2) indicated by the Super-Kamiokande data and sin(sup 2) 2(theta)(sub 13) is less than or approx. 0.2, the oscillations of multi-GeV neutrinos in the subdominant nu(sub mu) (r-reversible) nu(sub e) mode are enhanced by the MSW and parametric resonances. The parametric resonance, which occurs when the neutrinos cross the core of the earth, dominated for (Delta)m(sup 2) (approx-equal) (1-2) x 10 (exp -3) V(sup 2), sin(sup 2) 2(theta)(sub 13) is less than or approx. 0.06. The resonance matter effects lead to an observable excess of the e-like events with a specific zenith angle dependence even for small theta (sub 13). The up-down asymmetry of the multi GeV elike events can reach 15% for vertical-bar cos(Theta)(sub e) (vertical-bar) is greater than 0.2 and up to 30% for (vertical-bar) cos(Theta)(sub e) (vertical-bar) is greater than 0.6, where Theta(sub e) is the zenith angle of the electron. The resonance matter effects are relevant for the interpretation of the Super-Kamiokande data.
NTIS
Oscillations; Solar Neutrinos

20010020926 NASA Goddard Space Flight Center, Greenbelt, MD USA
Exploring the Extreme Universe with GLAST
Ritz, Steven; [2000]; 1p; In English; 29th; HEP Conference, Fort Lauderdale, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Gamma-ray Large Area Space Telescope, GLAST, is a satellite-based experiment under development to measure the cosmic gamma-ray flux in the energy range 20 MeV to is greater than 300 GeV. With a sensitivity that is more than a factor 30 greater than that of the EGRET detector on GRO, GLAST will open a new and important window on a wide variety of high energy phenomena, including supermassive black holes and active galactic nuclei, gamma-ray bursts, supernova remnants, and searches for new phenomena such as supersymmetric dark matter annihilations and big bang particle relics. The launch is planned for 2005. This talk will include a discussion of the physics, the scientific capabilities, the novel collaboration of particle physicists and high energy astrophysicists, and the mission status.
Author
Gamma Ray Telescopes; Gamma Ray Observatory; Gamma Ray Astronomy

20010020929 NASA Marshall Space Flight Center, Huntsville, AL USA
A Recommended Procedure for Estimating the Cosmic Ray Spectral Parameter of a Simple Power Law
Howell, Leonard W., NASA Marshall Space Flight Center, USA; [2000]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

A simple power law model consisting of a single spectral index a(f(sub i)) is believed to be an adequate description of the galactic cosmic ray (GQ proton flux at energies below 1013 eV. Two procedures for estimating a(f(sub i)), referred as (1) the method of moments, and (2) maximum likelihood, are developed and their statistical performance compared. I concluded that the maximum likelihood procedure attains the most desirable statistical properties and is hence the recommended statistic estimation procedure for estimating a1. The maximum likelihood procedure is then generalized for application to a set of real cosmic ray data and thereby makes this approach applicable to existing cosmic ray data sets. Several other important results, such as the relationship between collecting power and detector energy resolution, as well as inclusion of a non-Gaussian detector response function, are presented. These results have many practical benefits in the design phase of a cosmic ray detector because they permit instrument developers to make important trade studies in design parameters as a function of one of the science objectives, which is particularly important for space-based detectors where physical parameters, such as dimension and weight, impose practical limits to the design envelope.
Author
Maximum Likelihood Estimates; Galactic Cosmic Rays; Radiation Detectors

20010021128 NASA Goddard Space Flight Center, Greenbelt, MD USA
Galactic Diffuse Gamma Ray Emission is Greater than 10 GeV
Hunter, Stanley D., NASA Goddard Space Flight Center, USA; [2000]; 12p; In English; High Energy Gamma-Ray Astronomy, 26-30 Jun. 2000, Heidelberg, Germany; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

AGILE and Gamma-ray Large Area Telescope (GLAST) are the next high-energy gamma-ray telescopes to be flown in space. These instruments will have angular resolution about 5 times better than Energetic Gamma-Ray Experiment Telescope (EGRET) above 10 GeV and much larger field of view. The on-axis effective area of AGILE will be about half that of EGRET, whereas GLAST will have about 6 times greater effective area than EGRET. The capabilities of ground based very high-energy telescopes are also improving, e.g. Whipple, and new telescopes, e.g. Solar Tower Atmospheric Cerenkov Effect Experiment (STACEE), Cerenkov Low Energy Sampling and Timing Experiment (CELESTE), and Mars Advanced Greenhouse Integrated Complex

(MAGIC) are expected to have low-energy thresholds and sensitivities that will overlap the GLAST sensitivity above approximately 10 GeV. In anticipation of the results from these new telescopes, our current understanding of the galactic diffuse gamma-ray emission, including the matter and cosmic ray distributions is reviewed. The outstanding questions are discussed and the potential of future observations with these new instruments to resolve these questions is examined.
Author
Gamma Ray Astronomy; Spectral Emission; Gamma Ray Telescopes; Diffuse Radiation; Astrophysics; Measuring Instruments

20010021132 NASA Goddard Space Flight Center, Greenbelt, MD USA
Cosmic Ray and TeV Gamma Ray Generation by Quasar Remnants
Boldt, Elihu, NASA Goddard Space Flight Center, USA; Loewenstein, Michael, Maryland Univ., USA; [2000]; 4p; In English; High Energy Gamma-Ray Astronomy, 26-30 Jun. 2000, Heidelberg, Germany; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Results from new broadband (radio to X-ray) high-resolution imaging studies of the dormant quasar remnant cores of nearby giant elliptical galaxies are now shown to permit the harboring of compact dynamos capable of generating the highest energy cosmic ray particles and associated curvature radiation of TeV photons. Confirmation would imply a global inflow of interstellar gas all the way to the accretion powered supermassive black hole at the center of the host galaxy.
Author
Cosmic Rays; Quasars; Gamma Ray Astronomy; Black Holes (Astronomy); Elliptical Galaxies

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GENERAL

Includes aeronautical, astronautical, and space science related histories, biographies, and pertinent reports too broad for categorization; histories or broad overviews of NASA programs such as Apollo, Gemini, and Mercury spacecraft, Earth Resources Technology Satellite (ERTS), and Skylab; NASA appropriations hearings.

20010019987 Smithsonian Astrophysical Observatory, Cambridge, MA USA
ROSAT Science Data Center ***Final Report, 1 Apr. 1999 - 30 Sep. 2000***
Murray, Stephen, Smithsonian Astrophysical Observatory, USA; February 2001; 12p; In English
Contract(s)/Grant(s): NAS5-99002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report provides a summary of the Smithsonian Astrophysical Observatory (SAO) ROSAT SCIENCE DATA CENTER (RSDC) activities for the recent years of our contract. Details have already been reported in the monthly reports. The SAO was responsible for the High Resolution Imager (HRI) detector on ROSAT. We also provided and supported the HRI standard analysis software used in the pipeline processing (SASS). Working with our colleagues at the Max Planck in Garching Germany (MPE), we fixed bugs and provided enhancements. The last major effort in this area was the port from VMS/VAX to VMS/ALPHA architecture. In 1998, a timing bug was found in the HRI standard processing system which degraded the positional accuracy because events accessed incorrect aspect solutions. The bug was fixed and we developed off-line correction routines and provided them to the community. The Post Reduction Off-line Software (PROS) package was developed by SAO and runs in the IRAF environment. Although in recent years PROS was not a contractual responsibility of the RSDC, we continued to maintain the system and provided new capabilities such as the ability to deal with simulated AXAF data in preparation for the NASA call for proposals for Chandra. Our most recent activities in this area included the debugging necessary for newer versions of IRAF which broke some of our software. At SAO we have an operating version of PROS and hope to release a patch even though almost all functionality that was lost was subsequently recovered via an IRAF patch (i.e. most of our problems were caused by an IRAF bug).
Derived from text
Program Verification (Computers); High Resolution; Applications Programs (Computers); ROSAT Mission; Imaging Spectrometers; Display Devices

20010020624
Fiscal 1997 R and D project on industrial science and technology under a consignment from NEDO. R and D of the ultimate manipulation technology of atoms and molecules
Mar. 31, 1998; 83p; In Japanese; In English
Report No.(s): DE99-707609; ETDE/JP-99707609; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper describes R and D of the ultimate manipulation technology of atoms and molecules (atom technology). The R and D aims at establishment of observation/manipulation technology of atoms and molecules as common basic technology in various

industrial fields such as new material, electronics, bio-technology and chemistry. The R and D thus aims at establishment of observation/manipulation of solid surfaces and DNA organic molecules, formation of fine structures of atomic surface arrangement, and calculation/ simulation for predicting a reaction theorem of atom and molecule surfaces. In fiscal 1997, research was made on improvement and development of computer simulation environment, and description of an excited state of electrons by Green function. Establishment of a construction method and computation code is under investigation for pseudo-potential dependent on excitation energy. Survey was made on research trends of the atom technology by visiting overseas academic societies and institutions. International Symposium on Atom Technology was also held in Tokyo in Nov. 1997.
NTIS
Research and Development; Molecular Biology; Atomic Physics; Molecular Dynamics; Microstructure; Chemical Reactions; Reaction Kinetics

20010020804 National Science and Technology Council, Washington, DC USA
Review of Federal Programs for Wire System Safety
November 2000; 178p; In English
Report No.(s): PB2001-101590; DOT-T-00-08; No Copyright; Avail: CASI; A02, Microfiche; A09, Hardcopy

This report documents 42 federal and 18 industry science and technology projects concerning wire safety that are currently underway. The report concludes that wire system safety is a national issue that transcends government agencies and is important to public health and safety. It recommends that four basic strategies to improve wires system saftey: (1) altering perceptions of wire systems; (2) increasing collaboration between industry, academia, and the government; (3) improving the management and functionality of wire systems; and (4) developing advanced wire systems technology.
Author
Perception; Safety; Wire

20010020952 NASA Marshall Space Flight Center, Huntsville, AL USA
Scientific and Technical Reports, Articles, Papers, and Presentations, *FY 2000*
Waits, J. E. Turner, Compiler, NASA Marshall Space Flight Center, USA; January 2001; 78p; In English
Report No.(s): NASA/TM-2001-210795; M-997; NAS 1.15:210795; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This document presents formal NASA technical reports, papers published in technical journals, and presentations by MSFC personnel in FY 2000. It also includes papers of MSFC contractors. After being announced in STAR, all the NASA series reports may be obtained from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161. The information in this report may be of value to the scientific and engineering community in determining what information has been published and what is available.
Author
Technical Writing; Reports; Papers; Presentation

20010021691 InDyne, Inc., Cocoa Beach, FL USA
Chronology of KSC and KSC Related Events for 1999
Liston, Elaine E., InDyne, Inc., USA; Feb. 10, 2000; 160p; In English; CD-ROM contains full text document in PDF format
Report No.(s): NASA/TM-2000-208588; NAS 1.15:208588; NONP-NASA-CD-2001031116; No Copyright; Avail: CASI; A08, Hardcopy

This document is intended to serve as a record of Kennedy Space Center (KSC) events and is a reference source for historians and other researchers. Arrangement is by day and month and individual articles are attributed to published sources. Materials were researched and described by the KSC Library Archivist for KSC Library Services Contractor InDyne, Inc.
Author
Chronology; Spacecraft Launching; Spacecraft Landing; NASA Space Programs

20010021694 InDyne, Inc., Cocoa Beach, FL USA
Chronology of KSC and KSC Related Events for 2000
Liston, Elaine E., InDyne, Inc., USA; Atkins, Donna A., InDyne, Inc., USA; Guelzow, Deborah A., InDyne, Inc., USA; February 2001; 86p; In English; CD-ROM contains full text document in PDF format
Report No.(s): NASA/TM-2000-208590; NAS 1.15:208590; NONP-NASA-CD-2001031111; No Copyright; Avail: CASI; A05, Hardcopy

This document is intended to serve as a record of Kennedy Space Center (KSC) events and is a reference source for historians and other researchers. Arrangement is by day and month and individual articles are attributed to published sources. Materials were researched and described by the KSC Library Archivist with assistance from KSC Library Librarians for KSC Library Services Contractor InDyne, Inc.

Author

Chronology; Spacecraft Launching; Spacecraft Landing; NASA Space Programs

Subject Term Index

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