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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.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

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

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 4

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 13

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 14

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 20

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 22

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 22

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) 23

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 28

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

15 Launch Vehicles and Launch Operations 29

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 30

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*.

17 Space Communications, Spacecraft Communications, Command and Tracking 37

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also *04 Aircraft Communications and Navigation* and *32 Communications and Radar.*

18 Spacecraft Design, Testing and Performance 38

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.*

20 Spacecraft Propulsion and Power 40

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) 41

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 44

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

25 Inorganic, Organic, and Physical Chemistry 48

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 58

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

27 Nonmetallic Materials 66

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 71

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 76

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) 78

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 84

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 93

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 98

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 107

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 111

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 113

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 114

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

39 Structural Mechanics 115

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) 117

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 121

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 124

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 128

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

46 Geophysics 138

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 141

Includes weather observation forecasting and modification.

48 Oceanography 146

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) 150

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 178

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 180

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

54 Man/System Technology and Life Support 187

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 191

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

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59 Mathematical and Computer Sciences (General) 191

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 193

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 200

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 216

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 219

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 221

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

65 Statistics and Probability 222

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

66 Systems Analysis and Operations Research 223

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

67 Theoretical Mathematics 223

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) 224

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 232

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 238

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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Includes condensed matter physics, crystallography, and superconductivity. For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

77 Physics of Elementary Particles and Fields 257

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.*

Subject Categories of the Division I. Social and Information Sciences

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

81 Administration and Management 259

Includes management planning and research.

82 Documentation and Information Science 262

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

83 Economics and Cost Analysis 269

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84 Law, Political Science and Space Policy 269

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

85 Technology Utilization and Surface Transportation 270

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion.* For specific technology transfer applications see also the category where the subject is treated.

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) 270

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

89 Astronomy 271

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

90 Astrophysics 274

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

91 Lunar and Planetary Science and Exploration 280

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 283

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93 Space Radiation 284

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

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

99 General 285

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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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*

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VOLUME 40, APRIL 5, 2002

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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.

20020029717 Netherlands Energy Research Foundation, Petten, Netherlands

Insects Cause Double Stall

Sep. 2001; 8p; In English

Report No.(s): PB2002-103007; ECN-RX-01-052; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Several large commercial wind turbines demonstrate drops in maximum power levels up to 45% under apparently equal conditions. Earlier studies attempting to explain this effect by technical malfunctioning, aerodynamic instabilities and blade contamination effects estimated with computational fluid dynamics have not yet yielded a plausible explanation. A number of hypotheses was formulated, three of which were useful. by performing stall flag measurements, as well as two other experiments, one of the three hypotheses was confirmed: the Insect Hypothesis. Insects only fly in low wind, impacting near the edge of the blade. In low wind conditions, the 'insect roughness' has little influence on profile performance and power is not affected. In high winds, however, the flow pattern around the blade has changed, and contamination on the leading edge has a marked affect, resulting in power drop. In conclusion: the level of contamination changes only in low wind when insects fly and influences the power level in high winds when insects do not fly. As a consequence the power curve displays distinct levels at high wind speeds. NTIS

Stalling; Flow Distribution; Surface Roughness; Wind Velocity; Wind Direction; Computational Fluid Dynamics

20020029718 Netherlands Energy Research Foundation, Petten, Netherlands

Inviscid Stall Model

Corten, G. P.; Sep. 2001; 10p; In English

Report No.(s): PB2002-103006; ECN-RX-01-053; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Snel's boundary layer model on rotational effect gave the first estimate of three-dimensional effects in stall, which have been valuable understanding rotor behavior. The reason for an alternative was to include the often observed and intuitively expected radial flow. We model the separated flow area and show that the separated air flows in a radial stream with v, as the dominant velocity. Furthermore, the new model is not based on boundary layer theory: we use the full set of equations and do not use the property of boundary layers in which partial velocity gradients can be estimated with the ratio of differences, We describe the separated flow on rotating blades without any effect of viscosity, which seems to be a paradox. However by studying the physics of flow separation this becomes clear. Separation occurs because the air is coming to a standstill in the main flow direction due to friction and the positive pressure gradient. NTIS

Aerodynamic Stalling; Inviscid Flow; Pressure Gradients; Velocity Distribution; Separated Flow

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.

20020027538 NASA Glenn Research Center, Cleveland, OH USA

A Quantitative Comparison of Leading-Edge Vortices in Incompressible and Supersonic Flows

Wang, F. Y., National Academy of Sciences - National Research Council, USA; Milanovic, I. M., Hartford Univ., USA; Zaman, K. B. M. Q., NASA Glenn Research Center, USA; [2002]; 20p; In English; 40th AIAA Aerospace Sciences Meeting and Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Report No.(s): AIAA Paper 2002-0557; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

When requiring quantitative data on delta-wing vortices for design purposes, low-speed results have often been extrapolated to configurations intended for supersonic operation. This practice stems from a lack of database owing to difficulties that plague measurement techniques in high-speed flows. In the present paper an attempt is made to examine this practice by comparing quantitative data on the nearwake properties of such vortices in incompressible and supersonic flows. The incompressible flow data are obtained in experiments conducted in a low-speed wind tunnel. Detailed flow-field properties, including vorticity and turbulence characteristics, obtained by hot-wire and pressure probe surveys are documented. These data are compared, wherever possible, with available data from a past work for a Mach 2.49 flow for the same wing geometry and angles-of-attack. The results indicate that quantitative similarities exist in the distributions of total pressure and swirl velocity. However, the streamwise velocity of the core exhibits different trends. The axial flow characteristics of the vortices in the two regimes are examined, and a candidate theory is discussed.

Author

Incompressible Flow; Leading Edges; Supersonic Flow; Vortices; Delta Wings; Flow Characteristics

20020027548 Connecticut Univ., Dept. of Civil Engineering, Storrs, CT USA

Simulation and Modeling of Wind Effects on Airdrop Systems ***Final Report, 1 Feb. 1998-31 May 2001***

Accorsi, Michael L.; Leonard, John W.; Tezduyar, Tayfun E.; May 31, 2001; 25p; In English; Prepared in collaboration with Rice University, Houston, TX

Contract(s)/Grant(s): F49620-98-1-0214

Report No.(s): AD-A398317; AFRL-SR-BL-TR-01-0668; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project has been to develop computational tools for the simulation of candidate airdrop systems for the New World Vistas (NWV) Precision Airdrop (PAD) program. to accomplish this goal, researchers from the University of Connecticut, Rice University, and the US Army Soldier Systems Center at Natick have collaborated in developing a coupled Computational Fluid Dynamics (CFD) and Structural Dynamics (CSD) program to simulate three-dimensional, transient Fluid-Structure Interaction (FSI) phenomena for airdrop systems. The work performed under this project consists of: (1) development of new CFD methods; (2) development of new CSD methods; (3) development of new methods for coupled FSI simulations; (4) verification of the FSI model; and (5) simulation of candidate NWV airdrop systems. The FSI simulations require large scale, nonlinear, transient finite element models for the parachute system and surrounding airflow and therefore are computationally intensive. to address this difficulty, parallel computational techniques have been developed for the FSI model.

DTIC

Airdrops; Computational Fluid Dynamics; Computerized Simulation; Software Development Tools; Wind Effects

20020028174 Army Space and Missile Defense Command, Huntsville, AL USA

Ground-Based Midcourse Defense Element Live Fire Test and Evaluation (LFT and E) Targets ***Final Report***

Oct. 25, 2001; 75p; In English

Report No.(s): AD-A398369; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Strategic Targets Project Office, within the Ballistic Missile Targets Joint Project Office of the U.S. Army Space and Missile Defense Command, proposes to use vanous configurations of a seedant (deuterium fluoride), high explosive, and sensor instrumentation payload package on several target missile launches from Vandenberg Air Force Base (AFB) to independently verify Ground-based Midcourse Defense Element interceptor effectiveness. The proposed action consists of three main activities. The first would be the transport of the seedant and payload to Vandenberg AFB. The second would be integration of the seedant into the target vehicle. The third activity would be flight testing with the seedant payload aboard the target vehicle. The interceptor

missile would be launched from the U.S. Army Kwajalein Atoll/Ronald Reagan Ballistic Missile Test Site with intercept occurring over the Pacific Ocean.
DTIC
Flight Tests; Missile Tests; Antimissile Defense; Antimissile Missiles

20020030260 Naval Postgraduate School, Monterey, CA USA
Supersonic Flow Field Visualization Studies of the M (infinity) = 6 Price Waverider Planform
Garcia, Karl; Sep. 2001; 108p; In English
Report No.(s): AD-A397447; No Copyright; Avail: Defense Technical Information Center (DTIC)
Supersonic tests of the conical flow derived M(infinity) = 6 (design) Price waverider planform were conducted using the Naval Postgraduate School (NPS) wind tunnel. These tests are part of a continuing effort to study the characteristics of waverider configured vehicles. Two sting-mounted, flat-plate stainless-steel Price waverider planform models were utilized for testing in the NPS 4-inch by 4-inch cross section supersonic blowdown wind tunnel. Tests at Mach numbers of 1.7, 2.8, and 4 were attempted but flowfield studies were only completed at M(infinity) = 4.
DTIC
Waveriders; Supersonic Wind Tunnels; Supersonic Flow; Wind Tunnel Tests

20020030261 MSE Technology Applications, Inc., Butte, MT USA
Radiatively Driven Hypersonic Wind Tunnel (RDHWT) Program Magnetohydrodynamic Accelerator Research Into Advanced Hypersonics (MARIAH II) ***Final Report, Oct. 1997-Dec. 1998***
Simmons, Gloyd A.; Jan. 08, 2000; 335p; In English; Original contains color images
Report No.(s): AD-A397435; MSE-34; AEDC-TR-00-5; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report documents the first year's progress on the research for the development of enabling technology for the design of a Mach 8-15 flight duplication wind tunnel. This research program is entitled the Radiantly Driven Hypersonic Wind Tunnel/Magnetohydrodynamics Accelerator Research Into Advanced Hypersonics (RDHWT/MARIAH II) program. Direction of the program is provided by the USAF (USA Air Force) Arnold Engineering Development Center (AEDC). MSE Technology Applications, Inc. (MSE) is serving as the program prime integrating contractor. Other key team members include the US Department of Energy Federal Energy Technology Center (DOE-FETC), Lawrence Livermore National Laboratory (LLNL), Sandia National Laboratories (SNL), and Princeton University.
DTIC
Hypersonic Wind Tunnels; Magnetohydrodynamics

20020032690 NASA Ames Research Center, Moffett Field, CA USA
Evaluation of Computer Aided Vortex Forecast System
Rossow, Vernon J., NASA Ames Research Center, USA; [1995]; 1p; In English; Transport Canada-Aviation Meeting, 31 May - 1 Jun. 1995, Ottawa, Ontario, Canada
Contract(s)/Grant(s): RTOP 538-04-11; No Copyright; Avail: Issuing Activity; Abstract Only
Several countries, including the USA. Canada, Germany, England and Russia, are in the process of trying to develop some sort of computer-aided system that will guide controllers at airports on the hazard posed by lift-generated vortices that trail behind subsonic transport aircraft. The emphasis on this particular subject has come about because the hazard posed by wake vortices is currently the only reason why aircraft are spaced at 3 to 6 miles apart during landing and takeoff rather than something like 2 miles. It is well known that under certain weather conditions, aircraft spacings can be safely reduced to as little as the desired 2 miles. In an effort to perhaps capitalize on such a possibility, a combined FAA and NASA program is currently underway in the USA to develop such a system. Needless to say, the problems associated with anticipating the required separation distances when weather conditions are involved is very difficult. Similarly, Canada has a corresponding program to develop a vortex forecast system of their own.
Author
Vortices; Weather Forecasting; Computer Techniques; Transport Aircraft; Airports

20020032743 West Virginia Univ., Dept. of Mechanical and Aerospace Engineering, Morgantown, WV USA
Effects of Aircraft Wake Dynamics on Measured and Simulated NO(x) and HO(x) Wake Chemistry, Appendix B
Lewellen, D. C., West Virginia Univ., USA; Lewellen, W. S., West Virginia Univ., USA; [2001]; 15p; In English
Contract(s)/Grant(s): NAG1-2096; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

High-resolution numerical large-eddy simulations of the near wake of a B757 including simplified NOx and HOx chemistry were performed to explore the effects of dynamics on chemistry in wakes of ages from a few seconds to several minutes. Dilution plays an important basic role in the NOx-O3 chemistry in the wake, while a more interesting interaction between the chemistry and dynamics occurs for the HOx species. These simulation results are compared with published measurements of OH and HO2 within a B757 wake under cruise conditions in the upper troposphere taken during the Subsonic Aircraft Contrail and Cloud Effects Special Study (SUCCESS) mission in May 1996. The simulation provides a much finer grained representation of the chemistry and dynamics of the early wake than is possible from the 1 s data samples taken in situ. The comparison suggests that the previously reported discrepancy of up to a factor of 20 - 50 between the SUCCESS measurements of the [HO2]/[OH] ratio and that predicted by simplified theoretical computations is due to the combined effects of large mixing rates around the wake plume edges and averaging over volumes containing large species fluctuations. The results demonstrate the feasibility of using three-dimensional unsteady large-eddy simulations with coupled chemistry to study such phenomena.
Author
Aircraft Wakes; Hydrogen Compounds; Large Eddy Simulation; Near Wakes; Nitrogen Oxides; Computational Fluid Dynamics

20020033020 NASA Ames Research Center, Moffett Field, CA USA
Aerothermal/FEM Analysis of Hypersonic Sharp Leading Edges
Kolodziej, Paul, NASA Ames Research Center, USA; Bull, Jeffrey D., NASA Ames Research Center, USA; Kowalski, Thomas R., Thermoscience Inst., USA; [1995]; 1p; In English; HSFF Conference, 6-9 Nov. 1995, Houston, TX, USA
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

Advanced hypersonic vehicles, like wave riders, will have sharp leading edges to minimize drag. These designs require accurate finite element modeling (FEM) of the thermal-structural behavior of a diboride ceramic matrix composite sharp leading edge. by coupling the FEM solver to an engineering model of the aerothermodynamic heating environment the impact of non catalytic surfaces, rarefied flow effects, and multidimensional conduction on the performance envelopes of sharp leading edges can be examined.
Author
Hypersonic Vehicles; Sharp Leading Edges; Finite Element Method; Ceramic Matrix Composites; Aerothermodynamics

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.

20020027455 General Accounting Office, Washington, DC USA
National Airspace System. Long-Term Capacity Planning Needed Despite Recent Reduction in Flight Delays
Dec. 2001; 68p; In English
Report No.(s): PB2002-102002; GAO-02-185; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Addressing delay problems requires action by several sectors of the aviation community because no single entity has the authority or ability to solve delay-related problems. The federal government, especially through the Federal Aviation Administration (FAA) and its parent agency, the Department of Transportation (DOT), plays a major role by operating the nation's air traffic control system, distributing federal funding for airports, and setting operating standards for commercial aircraft and airports. However, the nation's airports are primarily owned and operated by local units of government, so that decisions about such steps as expanding airport capacity are primarily local in nature. The nation's airlines also play a key role. Their business decisions have a strong effect on the volume and routing of flights, the type and size of aircraft used, and the degree to which aircraft are upgraded to take advantage of new technology. This document examines the aviation community's efforts to reduce delays. We focused our work on the following questions: what initiatives are planned or under way by the federal government, airlines, and airports to address flight delays, what effect are these initiatives likely to have on reducing delays, and what other options are available to address delay problems.
NTIS
Airline Operations; Civil Aviation; National Airspace System; Planning; Air Traffic Control

20020027460 Dynamic Security Concepts, Inc., Mays Landing, NJ USA

Aviation Security Research and Development Division (AAR-500) Contract Management Handbook

Tropiano, D. M.; Wilson, D.; Sep. 21, 2001; 66p; In English

Report No.(s): PB2002-102247; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The Federal Aviation Administration's (FAA's) Acquisition Management System (AMS) was established to dramatically improve the agency's acquisition process by creating a framework for informed and innovative decision-making. The AMS provides extensive guidance regarding the FAA's procurement system. The stated goal of the procurement system is 'to obtain high quality products, services, and real property in a timely, cost effective manner, at prices that are fair and reasonable.' The Aviation Security Research and Development Division (AAR-500) recognized the need to supplement the policy and guidance provided by the AMS by identifying internal processes. This Handbook meets that need by clearly defining AAR-500 personnel roles, responsibilities, and process activities that uphold the procurement policy of the agency.

NTIS

Handbooks; Management Systems; Policies; Decision Making

20020027531 NASA Ames Research Center, Moffett Field, CA USA

A New Approach to Measuring Safety with Flight Data

Chappell, Sheryl L., NASA Ames Research Center, USA; Statler, Irving C., NASA Ames Research Center, USA; [1995]; 1p; In English; 18th International Symposium on Aircraft Integrated Monitoring Systems, 19-21 Sep. 1995, Stuttgart, Germany

Contract(s)/Grant(s): RTOP 505-54-53; No Copyright; Avail: Issuing Activity; Abstract Only

For over two decades, safety has been measured by screening flight data for deviations from prescribed operations. NASA and the FAA are developing a prototype system with a new approach, to complement these event-measurement systems. The premise is that, in addition to these events, much can be gained by analyzing all the flight data on a routine basis. The statistical analyses of this system enable the evaluation of normal as well as extreme operations. The trend analyses make it possible to foresee the potential occurrence of an unsafe operation and intervene before it occurs.

Author

Systems Analysis; Aeronautics; Aerospace Safety

20020027710 General Accounting Office, Washington, DC USA

Report to the Honorable Norman Y. Mineta, Secretary of Transportation, and the Honorable Donald H. Rumsfeld, Secretary of Defense. Aviation Safety. FAA and DOD Response to Similar Safety Concerns

Jan. 2002; 78p; In English

Report No.(s): PB2002-101985; GAO-02-77; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Safety of aircraft is a paramount concern in both civilian and military aviation because safety deficiencies can cost lives and equipment and affect mission accomplishment. The Federal Aviation Administration (FAA) and the military services often face common safety issues as they oversee the operation of similar aircraft or even dissimilar aircraft that use common parts and materials. Our preliminary work, however, showed that in some cases FAA and the military services have taken different actions to address similar aviation safety concerns. We recognize that there could be reasonable explanations for FAA and the military services taking different approaches in addressing such concerns. to shed more light in this area, we used a case study approach supplemented by a review of FAA's and Department of Defense's (DOD) aviation safety oversight processes and related interdepartmental communication efforts to: (1) examine different responses by FAA and DOD/military services to similar aviation safety concerns; and (2) assess the processes used by FAA and DOD to communicate information about similar aviation safety concerns.

NTIS

Aircraft Safety; Flight Safety; Congressional Reports

20020027838 Dynamics Research Corp., Wilmington, MA USA

Development of Candidate Crew Coordination Evaluation Methods and Materials ***Final Report, 10 Feb.-31 Oct. 1992***

Grubb, Gary; Simon, Robert; Leedom, Dennis K.; Zeller, J.; Oct. 2001; 126p; In English

Contract(s)/Grant(s): MDA903-92-D-0025

Report No.(s): AD-A398660; E-21867U; ARI-CR-2002-09; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report documents the development of candidate methods and materials for measuring and evaluating crew coordination in the Army's Aircrew Coordination Training Program. The methods are designed for use in evaluating aircrews in all Army aircraft or simulators. The evaluation methods rely on video recording of crew interactions in a simulator or aircraft. The report includes lessons learned from the validation testbed and describes how the evaluation methods and materials were improved to

produce a treed exportable evaluation package. The suggested process for evaluating crew coordination is designed to assist the Army to implement the new Aircrew Training Manuals. The primary evaluation measure is the ACE Checklist, which consists of a set of 13 crew coordination behaviors or Basic Qualities. Mission performance measures were developed to assess the operational effect of crew coordination on flight safety and mission effectiveness. The report provides materials and suggested applications and improvements that can be used to evaluate initial, refresher, and continuation aircrew coordination training conducted in resident courses or by units in the field. Evaluation materials include grade slips, behavioral measures, evaluator worksheets, and suggested mission performance measures, which are all packaged separately in a companion report, Crew Coordination Exportable Evaluation Package for Army Aviation.
DTIC
Coordination; Education; Flight Crews; Flight Training; Human Performance

20020028009 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Safety Study: Public Aircraft Safety
Oct. 23, 2001; 60p; In English
Report No.(s): PB2001-917004; NTSB/SS-01/01; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Public aircraft are aircraft operated for the purpose of fulfilling a government function that meets certain conditions under Title 49 USA code, Section 40102(a)(37). The Safety Board identified 341 public aircraft accidents that occurred during the years 1993-2000. As a result of these findings, the Board made safety recommendations to the Federal Aviation Administration and the General Services Administration.
NTIS
Aircraft Safety; Transportation; Safety Management; Air Transportation

20020028013 National Transportation Safety Board, Washington, DC USA
National Transportation Safety Board Safety Recommendations Adopted January 2002
Jan. 2002; 64p; In English
Report No.(s): PB2002-916601; NTSB/REC-02/01; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The report contains the National Transportation Safety Boards recommendations regarding aviation accidents.
NTIS
Safety Management; Air Transportation

20020028018 Dynamics Research Corp., Systems Div., Wilmington, MA USA
Development of Measures of Crew Coordination *Final Report*
Oct. 2001; 138p; In English
Contract(s)/Grant(s): DAHC35-89-D-0030; D.O.#1
Report No.(s): AD-A398690; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
This is one of thirteen archival reports from a series of research and development contracts dealing with aircrew coordination.
DTIC
Flight Crews; Rotary Wing Aircraft

20020028151 Dynamics Research Corp., Wilmington, MA USA
Trainer Instruction for the Aircrew Coordination Exportable Training Package
Pawlik, Eugene A., Sr.; Simon, Robert; Grubb, Gary; Zeller, Joseph L.; Oct. 2001; 51p; In English
Contract(s)/Grant(s): MDA903-92-D-0025
Report No.(s): AD-A398661; E-1128U; ARI-CR-2002-12; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The US Army Aviation Center (USAAVNC) requested the US Army Research Institute Aviation Research and Development Activity (USARIARDA) to provide an in-depth train-the-trainer course to prepare a cadre of selected instructor pilots (IPs) to field the Aircrew Coordination Exportable Training Package. USARIARDA and Dynamics Research Corporation prepared and conducted a 12-day, modified Aircrew Coordination Instructor Course and provided post-training consultation to the cadre. Ten IPs and one nonrated crewmember were trained; five of the IPs, one per each mission-type aircraft (attack, cargo, observation, utility, and fixed wing) were certified by USAAVNC as Aircrew Coordination Trainers. Post-training consultations were held prior and subsequent to the cadre's visit to Fort Campbell, KY.
DTIC
Coordination; Flight Crews; Training Devices; Flight Training

20020028165 Dynamics Research Corp., Wilmington, MA USA
Aircrew Coordination Exportable Training Package Trainer Guide ***Final Report, Jun. 1992-Dec. 1992***
Oct. 2001; 88p; In English
Report No.(s): AD-A398643; ARI-CR-2002-05; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This is one of thirteen archival reports from a series of research and development contracts dealing with aircrew coordination.
DTIC
Flight Crews; Training Devices; Flight Training

20020028382 Dynamics Research Corp., Wilmington, MA USA
Exploratory Research to Demonstrate the Feasibility of Conducting Crew Coordination Training in the OH-58 Aircraft
Zeller, J.; Grubb, Gary; Simon, Robert; Oct. 2001; 85p; In English; Prepared in cooperation with Anacape Sciences, Inc., Fort Rucker, AL
Contract(s)/Grant(s): MDA903-92-D-0025
Report No.(s): AD-A398663; E-1248U; ARI-CR-2002-13; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This document provides the results of exploratory research to demonstrate the feasibility of conducting crew coordination training in the OH-58 aircraft, using the Army's Aircrew Coordination Exportable Training Course. The hands-on portion of the course, usually conducted in visual flight simulators, was conducted instead in OH-58 aircraft. Observation pilots and aerial observers from an attack helicopter battalion received the academic portion of the course in conjunction with attack crews from the unit. Two OH-58 instructor pilots (IP), a unit trainer (UT), and four aircrews were selected to conduct the hands-on portion of the course in the OH-58 aircraft. The IPs and UT trained and evaluated the four aircrews during three missions flown in the aircraft. Audio recordings of each flight, gradeslips and evaluator worksheets modified for OH-58 crews, and participant exit interviews were used to collect data. The demonstration showed that it is practicable to conduct the hands-on portion of the course in the OH-58 aircraft but did not assess the effectiveness of the training. Recommendations concerning the best type of audio recorder, number of evaluation and training flights, and use of the 2B24 non-visual Flight Simulator are provided.
DTIC
Flight Crews; Flight Training; Flight Simulators; Helicopters; Attack Aircraft; Feasibility Analysis

20020028388 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
Results of the Data Analysis Army Aircrew Coordination Measures Testbed Conducted Conducted Spring 1990
Simon, Robert; Oct. 2001; 213p; In English
Contract(s)/Grant(s): MDA903-87-C-0523
Report No.(s): AD-A398687; ARIARDA-DRC-92-05; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
This is one of thirteen archival reports from a series of research and development contracts dealing with aircrew coordination.
DTIC
Flight Crews; Data Processing

20020028393 Dynamics Research Corp., Systems Div., Wilmington, MA USA
Exploratory Research to Test the Feasibility of Conducting Crew Coordination Training in the OH-58 Aircraft ***Final Report***
Zeller, Joseph L., Jr.; Grubb, Gary; Oct. 2001; 68p; In English
Contract(s)/Grant(s): MDA903-92-D-0025; D.O.#6
Report No.(s): AD-A398689; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This is one of thirteen archival reports from a series of research and development contracts dealing with aircrew coordination.
DTIC
Flight Crews; Effectiveness; Flight Simulators

20020029910 Air Command and Staff Coll., Maxwell AFB, AL USA
Effective Drop Zone Control: A Joint Necessity
Petrequin, Gregory J.; Apr. 1999; 69p; In English
Report No.(s): AD-A397479; AU/ACSC/156/1999-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
Current drop zone control doctrine and guidance is inadequate for the warfighter. While current regulations direct procedure, they do not cover the tactics and techniques or the 'art' of drop zone control. This has resulted in a deficiency of knowledge among the chief players in the airdrop game, the aircrews and the ground party that supports them. In addition, much of the current guidance is not practical for the battlefield. It is printed in large, heavy manuals that prevent the soldier from taking it with him

to the battlefield. This will cause him to rely on notes or memory, degrading his capabilities. Aircrews have certain expectations about the support they should expect on the drop zone but they are not always realized. The bottom line is that aircrews and ground parties need to have interoperability and be working off the same sheet of music.
DTIC
Flight Crews; Interoperability; Human Performance; Ground Crews

20020030268 Air Command and Staff Coll., Maxwell AFB, AL USA
Operational Risk Management Problems in Air Combat Command Units. Misguided Risk Quantification and a Lack of Integration Could Impede Implementation
Pedersen, David R.; Apr. 1999; 52p; In English
Report No.(s): AD-A397497; AU/ACSC/155/1999-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
In 1987, the US Army implemented Operational Risk Management (ORM) techniques in an attempt to reduce mishaps. by the early l990s, the Army reduced serious mishaps by more than 80%. In 1996, Air Combat Command (ACC) outlined its ORM implementation strategy in an attempt to reduce all types of mishaps while improving operational effectiveness. While this plan allows for a tailored approach to a wing's unique culture, the implementation has created some problems within ACC units. The commander of ACC emphasized that this implementation is a top down change in philosophy and not necessarily a new safety program. This is important because a cultural change is required to embed ORM seamlessly into everyday missions The main problem found during this study was that units are attempting to quantify risks without the necessary information or knowledge of the limitations with risk quantification. In addition to this misguided quantification, units are not properly integrating ORM into the mission; thus creating extra work that has little benefit. ACC is taking steps to improve the ORM process at the unit level by providing better information databases and automated risk assessments during mission scheduling. However, these programs are not in place and because of the emphasis ORM has from the top leadership, ACC units are basically trying to do too much too soon.
DTIC
Management Methods; Operational Problems; Risk; System Effectiveness

20020030280 Air War Coll., Maxwell AFB, AL USA
In Search of the Perfect Training Doctrine
Driver, William L.; Apr. 1997; 74p; In English
Report No.(s): AD-A398252; AU/AWC/RWP055/97-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
This paper examines the training challenges that face US Army aviation. It summarizes the training process as outlined in Army capstone manuals, illustrates the aviation training deficiencies, then diagrams the perfect solution to training. The end result is to describe the doctrinal training process in simple, usable terms. This approach delivers the military trainer a model that not only uses the experiences of numerous individual trainers but also employs a model currently used by the infantry and armor training centers. With the training dollar getting smaller, the military continuously searches for new ways to improve its use of training doctrine. The challenges that face military forces require a fundamental change in how aviation personnel are both trained and employed. The challenge is to improve doctrinal manuals so that the trainer has a clear understanding of warfighting training requirements. This demands an exacting level of specificity in task and purpose which results in clearly defined training. Today's trainer needs a doctrine that clearly outlines requirements and can be easily applied in today's tactical units. The doctrine must distinctly link training fundamentals with the realistic requirements to ensure that quality training results from efficiently focused resources and soldier effort expended. The training model outlined in this paper will offer such an outline. The intent is to assure this effort produces a specific product with minimum resources and minimum disruption to the soldier that makes a better use of training time. The concept is to apply clearly focused training tasks backed by written doctrine. A well defined doctrine, alone with simulation, are a critical part of this process.
DTIC
Education; Military Aviation; Armed Forces

20020030305 NASA Langley Research Center, Hampton, VA USA
Vertex Movement for Mission Status Graphics: A Polar-Star Display
Trujillo, Anna, NASA Langley Research Center, USA; January 2002; 23p; In English
Contract(s)/Grant(s): RTOP 706-21-71-02
Report No.(s): NASA/TM-2002-211414; NAS 1.15:211414; L-18138; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Humans are traditionally bad monitors, especially over long periods of time on reliable systems, and they are being called upon to do this more and more as systems become further automated. Because of this, there is a need to find a way to display the monitoring information to the human operator in such a way that he can notice pertinent deviations in a timely manner. One possible solution is to use polar-star displays that will show deviations from normal in a more salient manner. A polar-star display uses a polygon's vertices to report values. An important question arises, though, of how the vertices should move. This experiment investigated two particular issues of how the vertices should move: (1) whether the movement of the vertices should be continuous or discrete and (2) whether the parameters that made up each vertex should always move in one direction regardless of parameter sign or move in both directions indicating parameter sign. The results indicate that relative movement direction is best. Subjects performed better with this movement type and they subjectively preferred it to the absolute movement direction. As for movement type, no strong preferences were shown.
Author
Display Devices; Systems Health Monitoring; Human Performance

20020030825 Air Command and Staff Coll., Maxwell AFB, AL USA
Reengineering the Air Travel Process
Pike, Christopher A.; Apr. 1999; 61p; In English
Report No.(s): AD-A398249; AU/ACSC/161/1999-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
Every year, Department of Defense (DOD) travelers make thousands of trips that include air transportation. The vast majority of travelers use commercial air for their travel, even when there may be military air options available at greatly reduced cost to the taxpayer. The current process for arranging passenger travel does not allow for or encourage the use of these organic options because the visibility over them does not exist at the base Traffic Management Officer's level. This paper will recommend a reengineering effort that will provide travelers with a consolidated list of all travel options, with the ultimate aim of reducing travel costs. The reengineering will be modeled after the process currently used at the Joint Movement Control Group (US transportation Command), and will rely upon the Global Transportation Network as its centerpiece. The paper will explore the feasibility and costs associated with this concept. It will further explore and suggest strategies for encouraging commanders to actively support the program. The goal of the paper is to present a workable process that can be implemented with minimum costs and complication at the base level Traffic Management Office. This process will help to assure maximum use of already-existing organic airlift, and thereby reduce taxpayer costs.
DTIC
Defense Program; Commercial Aircraft; Air Transportation

20020030830 Air Command and Staff Coll., Maxwell AFB, AL USA
Breaking the Mission Planning Bottleneck: A New Paradigm
Gillott, Mark A.; Apr. 1998; 50p; In English; Original contains color images
Report No.(s): AD-A398531; AU/ACSC/099/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
Mission planning has come a long way from the days of the Wright brothers first flight in 1903. Today, mission planning has grown into an activity as complex as the machines that carry out the missions. No longer a luxury, automated mission planning systems are vital to the success of current and future air operations. The history of automated mission planning development has been a chaotic combination of official systems and grassroots stovepipes. The Air Force has always leaned towards UNIX based mission planning systems, but recent growth in the microprocessor industry has made personal computers a viable option. The Air Force's continued emphasis on UNIX based mission planning systems designed to do everything for everyone has created a bottleneck which may become a critical failure point when examined in light of increasing mission planning requirements. This paper relies on up-to-date information obtained through interviews and recent publications to analyze this bottleneck from the perspective of F-16 mission planning. As F-16 mission planning requirements grew through the early 1980s, early mission planning systems progressed along two paths. The larger effort was in the large UNIX based systems, which were generally better funded and large scoped projects. The second path was personal computer (PC) based systems, and while smaller in every sense has always been the preferred path by the users. Currently, two members of the Air Force Mission Support System (AFMSS) family dominate mission planning: the UNIX based Mission Planning System (MPS) and the PC based Portable Flight Planning Software (PFPS). The size, cost, usability, and portability of the MPS systems have created a bottleneck that threatens the future of mission planning unless a new direction is taken. This new direction must feature heavier use of PC systems, with emphasis on integrated products as opposed to one master mission planner that attempts to fulfill everyone's needs.
DTIC
Armed Forces (USA); Mission Planning; Military Operations

20020030831 Air Univ., Maxwell AFB, AL USA

Running on Empty: The Development of Helicopter Aerial Refueling and Implications for Future USAF Combat Rescue Capabilities

Colburn, Tracy W.; Mar. 1997; 47p; In English

Report No.(s): AD-A398604; AU/ACSC/0412/97-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

By 1999 the total active USA Air Force fighter wing equivalents will have shrunk from 24 to 13 in only ten years. The declining defense budget means painful force structure decisions lie ahead. Even as funds are drying up, the armed forces are being called upon to execute contingencies in places such as Haiti, Somalia, Liberia, and Bosnia. The future appears very busy for Air Force rescue units as well. According to Strategic Assessment 1996 Instruments of US Power by the National Defense University and the Institute for National Strategic Studies, US armed forces will most likely be called upon to engage in numerous evacuation and rescue missions for Westerners over the next quarter of a century. It goes on to predict the rescue of US military personnel under combat conditions, particularly downed flight crews, will also continue to be carried out on a fairly frequent basis. Ultimately it concludes, The practice by certain societies of abusing US military prisoners to put psychological pressure on the US government and public will only make such rescue operations more imperative. to accomplish these long-range operations USAF rescue helicopters rely greatly on aerial refueling from HC-130 tanker aircraft. Unfortunately, the current fleet of HC-130s has many deficiencies that degrade mission performance. Worse yet, based upon current operations tempo these tankers will begin to lose airworthiness in 2005. Despite the budget crunch the time has come to modernize the HC-130 fleet. by tracing helicopter aerial refueling from its inception during the Vietnam War to the present, this paper will demonstrate the need to purchase new HC-130J aircraft. This should occur even if it means delaying other programs or further cutting active duty personnel.
DTIC

Air to Air Refueling; Helicopters; Rescue Operations; Flight Tests

20020030899 Aeronautical Radio, Inc., Annapolis, MD USA

Health Monitoring for Airframe Structural Characterization

Munns, Thomas E., Aeronautical Radio, Inc., USA; Kent, Renee M., Aeronautical Radio, Inc., USA; Bartolini, Antony, Aeronautical Radio, Inc., USA; Gause, Charles B., Luna Innovations, Inc., USA; Borinski, Jason W., Luna Innovations, Inc., USA; Dietz, Jason, Luna Innovations, Inc., USA; Elster, Jennifer L., Luna Innovations, Inc., USA; Boyd, Clark, Luna Innovations, Inc., USA; Vicari, Larry, Luna Innovations, Inc., USA; Ray, Asok, Pennsylvania State Univ., USA; February 2002; 163p; In English; Original contains color illustrations

Contract(s)/Grant(s): NCC1-332; RTOP 728-30-10-02

Report No.(s): NASA/CR-2002-211428; NAS 1.26:211428; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This study established requirements for structural health monitoring systems, identified and characterized a prototype structural sensor system, developed sensor interpretation algorithms, and demonstrated the sensor systems on operationally realistic test articles. Fiber-optic corrosion sensors (i.e., moisture and metal ion sensors) and low-cycle fatigue sensors (i.e., strain and acoustic emission sensors) were evaluated to validate their suitability for monitoring aging degradation; characterize the sensor performance in aircraft environments; and demonstrate placement processes and multiplexing schemes. In addition, a unique micromachined multimeasure and sensor concept was developed and demonstrated. The results show that structural degradation of aircraft materials could be effectively detected and characterized using available and emerging sensors. A key component of the structural health monitoring capability is the ability to interpret the information provided by sensor system in order to characterize the structural condition. Novel deterministic and stochastic fatigue damage development and growth models were developed for this program. These models enable real time characterization and assessment of structural fatigue damage.
Author

Damage Assessment; Fatigue (Materials); Systems Health Monitoring; Airframe Materials; Aircraft Structures

20020031253 Air Command and Staff Coll., Maxwell AFB, AL USA

A Study on Contrasts. Similarities and Differences Between Development of Airpower and Space Power

Gilson, Scott E.; Apr. 1998; 58p; In English

Report No.(s): AD-A398532; AU/ACSC/100/1998-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

Space applications for military operations began in earnest in the late 1950s, but it wasn't until the Gulf War of 1991 that space power came to the forefront of the military mindset. While early airpower and current space power share similar foundations, and a common vision as to future applications, only airpower advanced to a combatant role, while space remains mired in a supporting role. Is the Air Force as committed to the continued growth and advancement of space power as the Army Air Corps was to the development and advancement of early airpower? This study examines similarities and differences between development of early airpower in the Army Air Corps, and development of space power within the Air Force, as America becomes increasingly reliant

on space assets and capabilities. In order to determine if the Air Force is poised to continue the growth and development of space power, this paper will review basic applications of the two technologies, depicting their roles in support of military operations. For airpower, the study focuses on the airplane's role during World War I and the turmoil its advocates faced in the post-war environment. For space, it will briefly discuss how the medium was used during the Cold War, but focus predominantly on the post Gulf War timeframe, especially in light of the growing operational advantages it provides the military. The paper then examines theoretical assertions regarding the relevance of airpower as discussed by Douhet, Mitchell and the Air Corps Tactical School between the two World Wars, and the contrast (if any) offered by the present lack of accepted, and functional, space power theory following the Gulf War. Next is a comparison of doctrinal development as it pertains to early support for airpower, and the present state of space power.
DTIC
Aerospace Systems; Defense Program; Armed Forces (USA)

20020031758 Air Force Research Lab., Materials and Manufacturing Directorate, Tyndall AFB, FL USA
Evaluation of the Compressed Air Foam System-Mobile (CAFS-M)
Kalberer, Jennifer L.; Oct. 05, 2001; 46p; In English; Original contains color images
Report No.(s): AD-A398737; AFRL-ML-TY-TR-2002-4507; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Marine Corps has approved the replacement of the Twin Agent Unit (TAU) with the Compressed Air Foam System-Mobile (CAFS-M) to provide initial response fire protection capabilities. Modifications were performed on the CAFS-M due to issues on the adequacy of the system to meet mission requirements. This test series validated the modifications, reconfirmed the CAFS-M capabilities and determined the radiant heat effects on firefighters while using the system. A series of seven JP-8 pool fires, ranging in size from 2500 to 7800-sq ft, were used to evaluate the 90% control and full extinguishment times. The effects of radiant heat on the firefighter were monitored using a remote telemetry data acquisition system to monitor skin temperature using temperature probes. System operation was evaluated by conducting tests for throw distance, agent duration, agent stream decay, agent flow rate, expansion ratio, 25% drainage time and foam concentration. The CAFS-M controlled and extinguished all fires within the maximum time criteria. The CAFS-M is capable of extinguishing fires twice the minimum requirement using only 25% of its capacity. Skin temperature measurements confirmed that the CAFS-M provided adequate performance to reduce radiant heat exposure and prevent any subsequent burns. System evaluation showed no performance inadequacies.
DTIC
Fire Prevention; Extinguishing; Fire Fighting

20020031764 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA
Flammability of Automotive Child Restraint Seats for Use in Aircraft
Johnson, R.; Wuethrich, L.; Nov. 2001; 36p; In English
Report No.(s): PB2002-101913; DOT/FAA/AR-TN01/42; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Child restraint seat used in aircraft are based on automotive designs that are required to pass a horizontal burn rate test method. The flammability of child seat materials was gauged against the Federal Aviation Administration (FAA) vertical Bunsen burner tests method. Basically, the vertical test prescribed in Federal Aviation Regulation (FAR) 25.853 (a) (1) (ii) allows a burn length of 8 inches and flame time of 15 seconds after exposure to a Bunsen burner flame for 12 seconds. Eight child restraint seats were purchased from a retail store. The seats were disassembled in order to cut test specimens from the various seat components. Because of the size of the seat and use of materials, in most cases it was not possible to prepare the required sample size and replicates. However, this did not impact the overall conclusions regarding the flammability of the materials tested. The test results indicated that the large majority of materials would not meet the FAA vertical fire test criteria. Also, some of the failed materials burned across the entire sample length, and others produced high flames or dense smoke. The findings are consistent with the knowledge that a horizontal burn test is far less severe than a vertical burn test.
NTIS
Flammability; Aircraft; Seats; Constraints

20020031772 Texas Univ., Center for Transportation Research, Austin, TX USA
Domestic and International Best Practice Case Studies, *Sep. 1999 - Aug. 00*
Mahmassani, H. S.; Slaughter, K.; Chebli, H.; McNerney, M.; Feb. 2001; 156p; In English
Report No.(s): PB2002-102274; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
Air transportation plays a vital role in the Texas economy. Air passenger/cargo traffic is projected to continue to increase considerably at many of the state's large airports. Ground access to airports is an important function that must be provided for at the regional level as well as in the immediate vicinity of the facility itself. Congestion problems affecting airport access are in some

instances reaching unacceptable proportions; there are also concerns regarding the negative impacts such congestion is having on air quality and other environmental considerations. Accordingly, these issues require concerted action to meet project needs. to address the above challenges and current gaps, this project will take a comprehensive look at the landside access issues associated with major airports in the state. It will seek to improve on existing planning procedures and processes to meet the unique needs of airport traffic demand, for both people and goods. to be effective, planning for airport access must be multimodal and intermodal; consider operational, regulatory, and capital-intensive infrastructure provision issues; consider multiple levels of scale/resolution; and recognize the unique dynamic aspects of air traffic demand, i.e., its temporal patterns. This report documents domestic and international best practice case studies. The overall impact of the entire airport transportation network must be considered in order to address ground access issues. This study confirms the objectives and tasks laid out in the research proposal.
NTIS
Air Transportation; Air Traffic; Air Quality; Airports

20020032230 Air Command and Staff Coll., Maxwell AFB, AL USA
The Military Airport Program: Air Power for Civil Aviation
Surgeoner, Robert F.; Apr. 1999; 45p; In English
Report No.(s): AD-A398896; AU/ACSC/207/1999-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Throughout U.S. aviation history, military aviation has shared numerous links to civil aviation. This report summarizes some of that shared history, and briefly describes significant legislation from the early 1900's through modern day issues. Furthermore, it specifically addresses the origin and development of the Military Airport Program, one of five designated set-aside funds under the Airport Improvement Program. Legislatively established in fiscal year 1991, the intent of the program was to take advantage of the numerous existing facilities at military bases identified for realignment or closure under Base Realignment and Closure (BRAC), and to convert them to civil or joint-use fields for minimal cost. As such, these airfields could then relieve more congested metropolitan airfields nearby, reduce projected departure and arrival delays, and significantly contribute to the overall capacity of the USA air transportation system. Administered by the Federal Aviation Administration, the program was harshly criticized in a General Accounting Office report in 1994. Since then, the FAA has taken numerous steps, acting upon the GAO's recommendations, to clarify and further define eligibility criteria for candidate airfields. This report will detail the GAO's investigation, conclusions, and recommendations, and compare them to the current state of the program. The author will also provide the reader with examples of the conversion process at work by briefly looking at each of the airports currently in the Military Airport Program.
DTIC
Military Aviation; Military Air Facilities; Civil Aviation

20020032744 Georgia Inst. of Tech., School of Industrial and Systems Engineering, Atlanta, GA USA
Simulation of the National Aerospace System for Safety Analysis ***Annual Report, 1 Mar. 2001 - 28 Feb. 2002***
Pritchett, Amy, Georgia Inst. of Tech., USA; Goldsman, Dave, Georgia Inst. of Tech., USA; [2002]; 4p; In English
Contract(s)/Grant(s): NAG2-1291
Report No.(s): E-24-T66; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Work started on this project on January 1, 1999, the first year of the grant. Following the outline of the grant proposal, a simulator architecture has been established which can incorporate the variety of types of models needed to accurately simulate national airspace dynamics. For the sake of efficiency, this architecture was based on an established single-aircraft flight simulator, the Reconfigurable Flight Simulator (RFS), already developed at Georgia Tech. Likewise, in the first year substantive changes and additions were made to the RFS to convert it into a simulation of the National Airspace System, with the flexibility to incorporate many types of models: aircraft models; controller models; airspace configuration generators; discrete event generators; embedded statistical functions; and display and data outputs. The architecture has been developed with the capability to accept any models of these types; due to its object-oriented structure, individual simulator components can be added and removed during run-time, and can be compiled separately. Simulation objects from other projects should be easy to convert to meet architecture requirements, with the intent that both this project may now be able to incorporate established simulation components from other projects, and that other projects may easily use this simulation without significant time investment.
Derived from text
Flight Simulators; Flight Simulation; Architecture (Computers)

20020033035 Georgia Inst. of Tech., School of Industrial and Systems Engineering, Atlanta, GA USA
Intelligent Pilot Aids for Flight Re-Planning in Emergencies ***Annual Report, 26 Apr. 2001 - 25 Feb. 2002***
Pritchett, Amy R., Georgia Inst. of Tech., USA; February 2002; 8p; In English

Contract(s)/Grant(s): NAG1-01055
Report No.(s): E-24-Y76; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Experimental studies were conducted with pilots to investigate the attributes of automation that would be appropriate for aiding pilots in emergencies. The specific focus of this year was on methods of mitigating automation brittleness. Brittleness occurs when the automatic system is used in circumstances it was not designed for, causing it to choose an incorrect action or make an inaccurate decision for the situation. Brittleness is impossible to avoid since it is impossible to predict every potential situation the automatic system will be exposed to over its life. However, operators are always ultimately responsible for the actions and decisions of the automation they are monitoring or using, which means they must evaluate the automation's decisions and actions for accuracy. As has been pointed out, this is a difficult thing for human operators to do. There have been various suggestions as to how to aid operators with this evaluation. In the study described in this report we studied how presentation of contextual information about an automatic system's decision might impact the ability of the human operators to evaluate that decision. This study focused on the planning of emergency descents. Fortunately, emergencies (e.g., mechanical or electrical malfunction, on-board fire, and medical emergency) happen quite rarely. However, they can be catastrophic when they do. For all predictable or conceivable emergencies, pilots have emergency procedures that they are trained on, but those procedures often end with 'determine suitable airport and land as quickly as possible.' Planning an emergency descent to an unplanned airport is a difficult task, particularly under the time pressures of an emergency. Automatic decision aids could be very efficient at the task of determining an appropriate airport and calculating an optimal trajectory to that airport. This information could be conveyed to the pilot through an emergency descent procedure listing all of the actions necessary to safely land the plane. However, there is still the potential problem of brittleness. This study examined the impact of contextual information in presentations of emergency descent procedures to see if they might impact the pilot's evaluation of the feasibility of the presented procedure. The study and its results are described in detail.

Author

Decision Support Systems; Flight Plans; Malfunctions; Pilot Performance; Automatic Control

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.

20020030362 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

Issues in Airborne Systems for Closely-Spaced Parallel Runway Operations

Pritchett, A., Massachusetts Inst. of Tech., USA; Carpenter, B., Massachusetts Inst. of Tech., USA; Asari, K., Massachusetts Inst. of Tech., USA; Kuchar, J., Massachusetts Inst. of Tech., USA; Hansman, R. J., Massachusetts Inst. of Tech., USA; [1995]; 6p; In English; 14th AIAA/IEEE Digital Avionic Systems Conference, 6-9 Nov. 1995, Cambridge, MA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Previously announced as 19980114724

Contract(s)/Grant(s): NAG2-716; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Efforts to increase airport capacity include studies of aircraft systems that would enable simultaneous approaches to closely spaced parallel runways in Instrument Meteorological Conditions (IMC). The time-critical nature of a parallel approach results in key design issues for current and future collision avoidance systems. These issues are being studied in two ways. First, a part-task flight simulator study has examined the procedural and display issues inherent in such a time-critical task. Second, a prototype collision avoidance logic capable of generating this maneuver guidance has been designed using a recently developed methodology.

Author

Runways; Airborne Equipment; Air Traffic Control; Collision Avoidance; Aviation Meteorology

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.

20020027246 Naval Postgraduate School, Dept. of Aeronautics and Astronautics, Monterey, CA USA
Fluid Mechanics of Compressible Dynamic Stall Control Using Dynamically Deforming Airfoils ***Final Report, 1 Apr. 2000-31 Mar. 2001***
Chandrasekhara, M. S.; Dec. 04, 2001; 41p; In English
Contract(s)/Grant(s): ARO-36477-EG
Report No.(s): AD-A398327; ARO-36477.10-EG; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the key results from the two components of the study: (1) development of the knowledge and understanding of the fundamental fluid mechanics of the interactions of the unsteady flow occurring under the influence of the time scales of airfoil reduced frequency and dynamic leading edge adaptation at different flow conditions; and (2) understanding of the role of the surface flow in compressible dynamic stall onset. For the former, a systematic investigation of the dynamic stall flow (or lack thereof) was carried out using a dynamically deforming leading edge airfoil, which allowed us to establish the fact there are some airfoil leading edge geometries that are indeed dynamic stall free. This offers the hope that rotor blade geometries can be adapted to avoid the destructive dynamic stall effects, while retaining its benefits. In the latter, 148 surface shear stress sensors were installed on an NACA 0012 airfoil and the flow behavior studied for various flow conditions, which showed the various stall onset mechanisms discovered earlier and also that the surface behavior becomes singular prior to stall onset.
DTIC
Aerodynamic Stalling; Airfoils; Deformation; Fluid Mechanics; Leading Edges; Unsteady Flow

20020027260 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada
Ejection Clearance in the CF-188 Aircraft
Meunier, Pierre; Aug. 01, 2001; 24p; In English; Original contains color images
Report No.(s): AD-A398570; DCIEM-TM-2001-136; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An ejection clearance trial was performed on the CF188 to determine the longest buttock-knee length that can eject without hitting the aircraft structure. Nine large subjects (pilots) ranging from 63rd to 99.9-percentile buttock-knee length were recruited for the study. The tests were carried out both in summer and winter flying clothing using the current Simplified Combined Harness (SCH) and the U.S. Air Force Torso Harness (TH), which required a modified seat. Although the study was not designed to assess shin clearance, the preliminary indication is that shin clearance to the main instrument panel is rather limited. Some of the individuals tested had little or no clearance in winter clothing. The glareshield was found to be the limiting factor upon ejection, followed by the DDI. However, since the glareshield is quite flimsy it does not appear likely to cause knee injury during ejection. Nevertheless with the current harness (SCH), buttock-knee lengths up to the CF aircrew selection limit of 673 mm (99th percentile) will clear the glareshield. This limit may be increased somewhat (^ 12 mm) if the glareshield is deemed to be nonhazardous. As evaluated, the torso harness and modified seat are more limiting than the current SCH by nearly 20 mm. However, thinner seat cushions and back pad would probably bring the buttock-knee length limit of the torso harness in line with that of the SCH.
DTIC
Ejection Seats; Escape Systems; Flight Crews; Harnesses; Ejection

20020027269 Federal Aviation Administration, Associate Administrator for NAS Development, Washington, DC USA
FAA Vertical Flight Bibliography, 1962-2001
Smith, Robert D.; Dec. 2001; 290p; In English
Report No.(s): AD-A398619; DOT/FAA/ND-00/3; No Copyright; Avail: CASI; A03, Microfiche; A13, Hardcopy

This bibliography has been assembled as an aid to those who are interested in research, engineering, and development pertaining to vertical flight aircraft (including helicopters, tiltrotor, and tiltwing vehicles) and their integration into the National Airspace System (NAS). The intended audience includes people within the Federal Aviation Administration (FAA), in industry, and in state and local governments Reports in this bibliography are documents specifically related, in whole or in pan to vertical flight aircraft and the infrastructure that supports their operation in the National Airspace System (NAS). These documents have

generally been sponsored or authored by the research, engineering, and development elements of the FAA. This is the eighth and probably the last version of this bibliography. It addresses approximately 440 reports published from 1962 to 2001.
DTIC
Vertical Takeoff Aircraft; Bibliographies; Aircraft Industry; National Airspace System; Vertical Flight

20020027457 General Accounting Office, Washington, DC USA
Military Aircraft. Services Need Strategies to Reduce Cannibalizations
Nov. 2001; 46p; In English
Report No.(s): PB2002-102012; GAO-02-86; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy
To compensate for shortfalls in logistics, all the military services (Army, Air Force, Navy, and Marine Corps) have resorted to cannibalization. The Department defines cannibalization as removing serviceable parts from one piece of equipment and installing them in another. Because of the concern that heavy use of cannibalization may increase both aviation maintenance costs and workloads, we were asked to examine the practice in the services. Accordingly, we determined: (1) the extent to which the Army, the Navy, and the Air Force depend on cannibalizations to maintain aircraft; (2) the effects of cannibalizations; and (3) the reasons for cannibalizations. In addition, we assessed the sufficiency of the actions the Department of Defense and the services are taking to reduce the practice.
NTIS
Maintenance; Spare Parts

20020027677 NASA Ames Research Center, Moffett Field, CA USA
Optimal Trajectories and Control Strategies for the Helicopter in One-Engine-Inoperative Terminal-Area Operations
Chen, Robert T. N., NASA Ames Research Center, USA; Zhao, Yi-Yuan, Minnesota Univ., USA; [1995]; 2p; In English; AGARD Symposium on Advances in Rotorcraft Technologies, May 1996, Ottawa, Canada; Sponsored by Advisory Group for Aerospace Research and Development, France
Contract(s)/Grant(s): RTOP 505-59-36; No Copyright; Avail: Issuing Activity; Abstract Only
Engine failure represents a major safety concern to helicopter operations, especially in the critical flight phases of takeoff and landing from/to small, confined areas. As a result, the JAA and FAA both certificate a transport helicopter as either Category-A or Category-B according to the ability to continue its operations following engine failures. A Category-B helicopter must be able to land safely in the event of one or all engine failures. There is no requirement, however, for continued flight capability. In contrast, Category-A certification, which applies to multi-engine transport helicopters with independent engine systems, requires that they continue the flight with one engine inoperative (OEI). These stringent requirements, while permitting its operations from rooftops and oil rigs and flight to areas where no emergency landing sites are available, restrict the payload of a Category-A transport helicopter to a value safe for continued flight as well as for landing with one engine inoperative. The current certification process involves extensive flight tests, which are potentially dangerous, costly, and time consuming. These tests require the pilot to simulate engine failures at increasingly critical conditions, Flight manuals based on these tests tend to provide very conservative recommendations with regard to maximum takeoff weight or required runway length. There are very few theoretical studies on this subject to identify the fundamental parameters and tradeoff factors involved. Furthermore, a capability for real-time generation of OEI optimal trajectories is very desirable for providing timely cockpit display guidance to assist the pilot in reducing his workload and to increase safety in a consistent and reliable manner. A joint research program involving NASA Ames Research Center, the FAA, and the University of Minnesota is being conducted to determine OEI optimal control strategies and the associated optimal,trajectories for continued takeoff (CTO), rejected takeoff (RTO), balked landing (BL), and continued landing (CL) for a twin engine helicopter in both VTOL and STOL terminal-area operations. This proposed paper will present the problem formulation, the optimal control solution methods, and the key results of the trajectory optimization studies for both STOL and VTOL OEI operations. In addition, new results concerning the recently developed methodology, which enable a real-time generation of optimal OEI trajectories, will be presented in the paper. This new real-time capability was developed to support the second piloted simulator investigation on cockpit displays for Category-A operations being scheduled for the NASA Ames Vertical Motion Simulator in June-August of 1995. The first VMS simulation was conducted in 1994 and reported.
Author
Engine Failure; Flight Tests; Flight Simulation; Helicopter Engines; Trajectories

20020027694 Analytical Services and Materials, Inc., Hampton, VA USA
Development of Structural Integrity Analysis Methods for Aircraft Structures. AFGROW Component Object Model (COM) Server Interface Manual, Release 10 ***Final Report, 1 May 1998-30 Apr. 2001***
Harter, James A.; Litvinov, Alexander; May 2001; 102p; In English

Contract(s)/Grant(s): F33615-94-D-3212; Proj-2401
Report No.(s): AD-A398517; AFRL-VA-WP-TR-2001-3025; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The AFGROW COM Server allows users to perform automated crack growth life analyses using Microsoft Component Object Model (COM) technology. AFGROW may be called by any Windows software that is COM aware (Microsoft Office using Visual BASIC for Applications, Visual BASIC, Visual C++, Borland C++, and many others). This manual describes the use of the COM capabilities currently included in the crack growth life prediction software, AFGROW.

DTIC

Aircraft Structures; Fracture Mechanics; Structural Analysis; Computer Programs

20020027696 National Bureau of Standards, Gaithersburg, MD USA

Mechanical Failures of Metals in Service

Bennett, John A.; Quick, G. W.; Sep. 27, 1954; 42p; In English
Report No.(s): AD-A398530; NBS-CIRCULAR-550; No Copyright; Avail: Defense Technical Information Center (DTIC)

For many years the National Bureau of Standards has made examinations of metal parts that have failed in service for evidence hearing on the causes of failure. Thirty-five such cases representing the most frequently observed types of failures are described, and the factors of design, fabrication, or use contributing to these failures are presented. The characteristics by which the various types of fractures can be recognized are discussed, and recommended precautions that should be observed to reduce mechanical failures of metals in service are included.

DTIC

Aircraft Equipment; Fractures (Materials); Metals; Failure

20020028017 Dynamics Research Corp., Systems Div., Wilmington, MA USA

Aircrew Coordination Exportable Training Package Student Guide ***Final Report***

Oct. 2001; 359p; In English
Report No.(s): AD-A398691; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This is one of thirteen archival reports from a series of research and development contracts dealing with aircrew coordination.

DTIC

Flight Crews; Flight Training; Rotary Wing Aircraft

20020030283 Air Command and Staff Coll., Maxwell AFB, AL USA

Flight Formation Development for Assault Support Aircraft V-22 and C-130

Clark, Kenneth W.; Apr. 1998; 74p; In English
Report No.(s): AD-A398332; AU/ACSC/98-050/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research paper is to be utilized by aircrew involved in the development of aviation tactics and/or operational test and evaluation. Knowledge of aviation operations is required to obtain a comprehensive understanding of the methodology and information presented to support the project conclusions. The thesis of this research paper is to develop an optimized, mutually supportive formation(s) for the V-22 and C-130. I will use the capabilities and limitations of the human eye to determine an aircraft's POD and correlate it to the aircraft s field of view (FOV). The methodology of research will begin by defining a set of formation principles. My historical research determined those principles to be mutually supportive look-out, maneuverability, flexibility, command and control, protection, self-navigation and unity of effort. to better support the projects POD studies, an understanding of how the human eye interacts with the effects of luminance, target size and contrast is necessary. The project's two case studies (Look-up and Look-down), utilized interpolated data from a report completed by the RAND Corporation. This research project departs from the RAND report by analyzing the POD distances to develop optimized aircraft formations. The research scope provides the necessary assumptions and limitations and includes the following: flight visibilities, search areas, field of view (FOV) restrictions and background to aircraft contrasts. The case study findings determined that the optimum distances to detect incoming aircraft is 2 2.65nm for a 50% POD and 1.6 2nm for a 75% POD. The optimum formation is the three-aircraft division, using the inverted Y formation. For future research and development, additional efforts should be directed towards determining the adverse effects of movement in a formation.

DTIC

V-22 Aircraft; C-130 Aircraft; Attack Aircraft; Pods (External Stores); Command and Control

20020030285 Air Command and Staff Coll., Maxwell AFB, AL USA

Tactical Reconnaissance: UAVS Versus Manned Aircraft

Kumar, Rajesh; Mar. 1997; 42p; In English

Report No.(s): AD-A398405; AU/ACSC/0349/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

Ever since the Isrealis demonstrated how Unmanned Aerial Vehicles (UAVs) could be effectively used in operations, interest in UAVs has intensified. Following their successful employment on the battlefield in Desert Storm, technology has driven the development of more capable UAVs. The major improvements in UAVs in recent years have been in the role of tactical reconnaissance. In this role the UAV has significant capabilities to offer, some that are unmatched by other platforms. This paper will demonstrate that with the growing importance of information in warfare the UAV is suited to fill the information gap on the battlefield. The doctrine for UAV operations has not kept pace with the fast paced developments in this field. Their organization also needs to break out of the traditional mind-set. When employed in an efficient manner, the inherent qualities of expendability and low cost make the UAV capable of significantly complementing manned aircraft platforms in the role of tactical reconnaissance.

DTIC

Pilotless Aircraft; Military Operations; Reconnaissance Aircraft

20020030287 Air Command and Staff Coll., Maxwell AFB, AL USA

Special Air Missions: A Path to the 21st Century

Miner, James E.; Mar. 1997; 44p; In English; Original contains color images

Report No.(s): AD-A398449; AU/ACSC/0328/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

Providing worldwide airlift for the most senior USA government and military leaders has been the primary mission of numerous organizations spanning each of the military services. These leaders have relied on these aircraft as flying offices while abroad, allowing them to engage wherever US national interests lie. Over the years, this fleet has grown and developed on an ad hoc basis. The primary fleet, owned and operated by the 89th Airlift Wing at Andrews AFB, has the primary mission of airlifting the President, Vice President, and other national and international leaders. Because these aircraft were often unavailable for senior military members from the sister services, the Army and Navy each established a detachment of business jet type aircraft to fill their own needs. Additionally, the various Commanders-in-Chief of the unified and specified commands have a variety of aircraft at their disposal to oversee operations in their specific areas of responsibility. Thus, Chapter one serves as the introduction to current SAM operations, outlining each of the units, their primary customers, and their aircraft. However, due to the shrinking defense budgets and mounting costs to operate and maintain these aging and unique fleets, now is the time to plan for the next century. Therefore, Chapter two develops the SAM fleet to meet the 21st century needs. First, a foundation is established by linking the fleet to the National Security Strategy. Adding to this foundation, joint doctrine provides the basis for consolidating the CONUS-based SAM units into one organization under the umbrella of the US Transportation Command. The result of this consolidation would be a simplified command and control structure, reduced support manning, and the opportunity to reduce the number and types of airframes in the inventory.

DTIC

Command and Control; Jet Aircraft; Military Operations; Defense Program

20020030827 General Accounting Office, Washington, DC USA

Aviation Safety: FAA and DOD Response to Similar Safety Concerns

Jan. 2002; 75p; In English; Mineta, Secretary of Transportation, and the Honorable Donald H. /Rumsfeld, Secretary of Defense

Report No.(s): AD-A398323; GAO-02-77; No Copyright; Avail: Defense Technical Information Center (DTIC)

Safety of aircraft is a paramount concern in both civilian and military aviation because safety deficiencies can cost lives and equipment and affect mission accomplishment. The Federal Aviation Administration (FAA) and the military services often face common safety issues as they oversee the operation of similar aircraft or even dissimilar aircraft that use common parts and materials. Preliminary work, however, showed that in some cases FAA and the military services have taken different actions to address similar aviation safety concerns. We recognize that there could be reasonable explanations for FAA and the military services taking different approaches in addressing such concerns.

DTIC

Aircraft Safety; Defense Program; Military Technology

20020032300 Florida Univ., Aerospace Engineering, Mechanics and Engineering Science Dept., Gainesville, FL USA
Flexible Wing Base Micro Aerial Vehicles: Composite Materials for Micro Air Vehicles ***Final Report***
Ifju, Peter G., Florida Univ., USA; Ettinger, Scott, Florida Univ., USA; Jenkins, David, Florida Univ., USA; Martinez, Luis, Florida Univ., USA; [2002]; 12p; In English
Contract(s)/Grant(s): NCC1-397; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper will discuss the development of the University of Florida's Micro Air Vehicle concept. A series of flexible wing based aircraft that possess highly desirable flight characteristics were developed. Since computational methods to accurately model flight at the low Reynolds numbers associated with this scale are still under development, our effort has relied heavily on trial and error. Hence a time efficient method was developed to rapidly produce prototype designs. The airframe and wings are fabricated using a unique process that incorporates carbon fiber composite construction. Prototypes can be fabricated in around five man-hours, allowing many design revisions to be tested in a short period of time. The resulting aircraft are far more durable, yet lighter, than their conventional counterparts. This process allows for thorough testing of each design in order to determine what changes were required on the next prototype. The use of carbon fiber allows for wing flexibility without sacrificing durability. The construction methods developed for this project were the enabling technology that allowed us to implement our designs. The resulting aircraft were the winning entries in the International Micro Air Vehicle Competition for the past two years. Details of the construction method are provided in this paper along with a background on our flexible wing concept.
Author
Flexible Wings; Flight Characteristics; Aerospace Vehicles; Composite Materials; Aircraft Design

20020032311 Naval Surface Warfare Center, Indian Head Div., Indian Head, MD USA
MIL-STD-1760 Digital Launcher for Navy/Marine Corp 2.75-Inch Rocket System
Paras, Charles; Culhane, David; Neitzke, Craig; May 14, 2001; 22p; In English; Original contains color images; Proceedings from Armaments for the 2nd Annual Missiles & Rockets Symposium & Exhibition, 14-16 May 2001 sponsored by NDIA., The original document contains color images
Report No.(s): AD-A398151; No Copyright; Avail: Defense Technical Information Center (DTIC)

The viewgraphs for the MIL-STD-1760 Digital Launcher for Navy/Marine Corp 2.75-Inch Rocket System briefing are presented.
DTIC
Rocket Launching; Rocket Launchers

20020032320 Air Univ., Maxwell AFB, AL USA
A Comparative Analysis of Internal and External Solutions to Provide Air Combat Maneuvering Instrumentation Functionality
Panarisi, Michael T.; Dec. 2001; 88p; In English
Report No.(s): AD-A398741; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Air Combat Command (ACC) relies on Air Combat Maneuvering Instrumentation (ACMI) systems for air-to-air combat training and large force employment flight debrief. Although extremely effective training enhancements, these systems are enormously expensive and typically require flight over restricted airspace ranges. These factors have prevented fleetwide implementation of ACMI training on a daily basis. Basic ACMI systems determine aircraft position and performance data and transmit the data to ground-based monitoring stations for recording, display, and debrief. Early jet fighter aircraft required special external components, or 'pods', to calculate and transmit the data to custom-built computerized debrief facilities. Modern aircraft do not retain this limitation, and low-cost personal computers now offer computational and graphics display capability sufficient for ACMI debrief. Current avionics systems calculate all the necessary data and report the required parameters on the aircraft avionics system bus. Monitoring and recording this onboard data will reduce the requirement for special ranges, eliminate pod requirements, and allow debrief and presentation on conventional computer equipment typically available in fighter squadrons. Internal data also offers avionics parameters that are not available to pod-based systems. This data represents an enormous untapped resource for flight debrief. Perhaps the greatest potential contribution offered by internal systems involves combat mission debrief capability. Because external pods occupy weapons stations, it is extremely unlikely that crews would ever carry these components into combat. Internal components are the only alternative that can provide ACMI features for a combat mission debrief. Additionally, internal components preserve the aerodynamic and radar signature characteristics of the aircraft, a feature essential for stealth aircraft employment.
DTIC
Computerized Simulation; Jet Aircraft; Fighter Aircraft; Military Operations

20020032323 Air Command and Staff Coll., Maxwell AFB, AL USA

Beyond the Wild Blue Yonder: Creating an 'Air and Space' Culture in Today's Air Force

Grey, Cynthia J.; Apr. 1998; 49p; In English

Report No.(s): AD-A398757; No Copyright; Avail: Defense Technical Information Center (DTIC)

For the Air Force (AF), military space is now in the limelight following the release of Global Engagement: A Vision for the 21st Century Air Force. This pamphlet includes the most important Air Force statement ever concerning the role of space in the future of the Air Force: We are now transitioning from an air force into an air and space force on an evolutionary path to a space and air force. to make this transition, according to General Howell M. Estes III, Commander in Chief, USA Space Command, two major things must happen: One of them is a cultural change. We all grew up with the air part of the Air Force, and many of us look at the space piece as being a little bit of a threat to the kinds of things that air power does. That attitude has to change. How can the Air Force create the culture necessary to transition from an air force to an air and space force? Through research via the AU Library, I offer a definition of culture and discuss how culture develops and can be changed. I reviewed historical documentation at the Air University Historical Research Agency to gain historical insight into the formation of Air Force culture during the 1940s. I interviewed General Howell M. Estes III, Commander in Chief, United States Space Command, Major General Robert Dickman, DOD (Department of Defense) Space Architect, Major General (S) H. Marshal Ward, USAF/XOO, and Mr Brent Collins, PEO/Space, on their perspectives of the current Air Force culture and how to successfully transition to an air and space culture. Combining history with current thoughts, I have articulated how the AF can successfully transition culturally, beyond the wild blue yonder, to an air and space force.

DTIC

Armed Forces (USA); Aerospace Environments; Culture (Social Sciences); Management

20020032326 Air Command and Staff Coll., Maxwell AFB, AL USA

The Quest for Air Dominance: F-22--Cost Versus Capability

Hampton, Thomas W.; Apr. 1998; 45p; In English; Original contains color images

Report No.(s): AD-A398765; AU/ACSC/111/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

Since the incorporation of the airplane into military service, air superiority has been a key ingredient to success on the modern battlefield. Global Engagement: A Vision for the 21st Century Air Force, the USAF's (United States Air Force) latest vision statement, lists air and space superiority as the first of six Air Force core competencies. The F-15 Eagle is currently the USAF's primary air superiority fighter. Designed in the 1960s and introduced into service in the mid-1970s, the F-15's status as the world's premiere air superiority fighter is being challenged by new fighter designs from numerous countries, as well as the proliferation of advanced surface-to-air missile systems. The F-22 is the USAF's follow on air superiority fighter to the F-15. The design features of stealth, supersonic cruise, integrated avionics, and sustained maneuverability will provide the F-22 with a first look, first shot, first kill capability in all environments, against all current and planned future threats. However, at $102 million a copy, the F-22 is by far the most expensive fighter the USAF has ever pursued. Along with the collapse of the Soviet Union, today's environment of shrinking defense budgets has called into question the necessity of buying the F-22 at all. Although there are a number of less expensive alternatives, none of them approach the combat capability of the F-22. The USAF is scheduled to buy 339 F-22s which will reach initial operational capability in late 2004. This schedule must be maintained in order to ensure the USAF can provide air superiority for U.S. forces in the future.

DTIC

Armed Forces (USA); Fighter Aircraft

20020032617 Air Command and Staff Coll., Maxwell AFB, AL USA

Air Power in the Korean War

Grahn, James A.; Himes, Thomas P.; Apr. 1998; 45p; In English

Report No.(s): AD-A398753; No Copyright; Avail: Defense Technical Information Center (DTIC)

This technology project focuses on the Korean War from the U.S. Air Force perspective. It details the start of the war and possible causes. It outlines major players in the war to include President Truman, FEC (Far East Command) Commanders MacArthur, Ridgway, and Clark, and FEAF (Far East Air Forces) Commanders Stratemeyer and Weyland. The product then chronicles major events of the war in time slices from one month to two years long. Major operations discussed include: the Inchon landing, maintenance of the Pusan Perimeter, the railway interdiction campaign, Operation Strangle, and Operation Saturate. The product lists and compares aircraft in the opposing air forces. It ends with lessons learned from the Korean War. This product is written from the U.S. Air Force perspective and, therefore, does not detail ground campaigns, nor Navy or Marine air operations.

The extensive operation of air-lifters is not discussed. The tremendous effort put forth by UN (United Nations) partners in this conflict is also beyond the scope of this product.
DTIC
Armed Forces (USA); Histories; Bomber Aircraft

20020032623 Northrop Grumman Corp., Hawthorne, CA USA
Smart Materials and Structures-Smart Wing. Volumes 1, 2, 3 and 4 ***Final Report, 1 Dec. 1994-1 Sep. 1998***
Martin, Christopher A.; Kudva, Jayanth N.; Austin, Fred; Jardine, A. P.; Scherer, Lewis B.; Lockyer, Allen J.; Carpenter, Bernie F.; Dec. 1998; 532p; In English; Original contains color images
Contract(s)/Grant(s): F33615-95-C-3202; Proj-4Y10
Report No.(s): AD-A398965; NOR-00-804; AFRL-ML-WP-TR-1999-4162; No Copyright; Avail: Defense Technical Information Center (DTIC)

This final report of the DARPA (Defense Advanced Research Projects Agency)-sponsored, Air Force Research Laboratory administered Smart Wing Phase 1 program documents key results and conclusions reached in the application of smart materials to both subsonic and transonic adaptive wing development. The program effort for the subsonic regime targeted an F/A-18 class vehicle, and examined 1) variable wing twist effected by a nickel titanium (NiTi) shape memory alloy (SMA) torque tube and 2) hingeless, smoothly contoured trailing edge control surface deployment using SMA wires. Two 16% scale wing wind tunnel models were fabricated, one with SMA actuated control surfaces and the other of conventional design, and tested at NASA Langley Research Center (LaRC). Up to and greater than a 10% increase in lift and rolling moment versus a conventional flap and aileron was demonstrated for the Smart Wing design. Program development for the transonic effort, on the other hand, was focused on commercial aircraft, and examined two approaches for gaining fuel savings by optimizing transonic cruise: 1) an adaptive wing that employed TERFENOL-D linear actuators in the wing box structure (between the spars) to optimize airfoil shape, and 2) camber modification with smoothly contoured trailing edge, also powered by a TERFENOL-D linear wave actuator. The latter approach was downselected and program studies showed that fuel savings of 5% were achievable equating to cost savings up to $7 billion per year for US-based commercial jet fleets. The work performed under this contract is being continued under an on-going Phase 2 effort. This work will be completed in early 2001 and is expected to lead to flight testing on unmanned aircraft, leading the way for near-term technology transition to operational flight vehicles.
DTIC
Wings; Aircraft Design; Smart Materials; Smart Structures

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.

20020027988 Research Triangle Inst. International, Hampton, VA USA
The Effect of Ownship Information and NexRad Resolution on Pilot Decision Making in the Use of a Cockpit Weather Information Display
Novacek, Paul F., Research Triangle Inst. International, USA; Burgess, Malcolm A., Research Triangle Inst. International, USA; Heck, Michael L., Research Triangle Inst. International, USA; Stokes, Alan F., Research Triangle Inst. International, USA; December 2001; 170p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-99074; RTOP 728-40-10-03
Report No.(s): NASA/CR-2001-210845; NAS 1.26:210845; Rept-7473-025; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

A two-phase experiment was conducted to explore the effects of data-link weather displays upon pilot decision performance. The experiment was conducted with 49 instrument rated pilots who were divided into four groups and placed in a simulator with a realistic flight scenario involving weather containing convective activity. The inflight weather display depicted NEXRAD images, with graphical and textual METARs over a moving map display. The experiment explored the effect of weather information, ownship position symbology and NEXRAD cell size resolution. The phase-two experiment compared two groups using the data-linked weather display with ownship position symbology. These groups were compared to the phase-one group that did not have ownship position symbology. The phase-two pilots were presented with either large NEXRAD cell size (8 km)

or small cell size (4 km). Observations noted that the introduction of ownship symbology did not appear to significantly impact the decision making process, however, the introduction of ownship did reduce workload. Additionally, NEXRAD cell size resolution did appear to influence the tactical decision making process.
Author
Meteorological Radar; Decision Making; Data Links; Flight Simulators; Pilot Support Systems; Cockpit Weather Information Systems; Display Devices

20020029084 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA
Experimental Studies of the Effect of Intent Information on Cockpit Traffic Displays
Barhydt, Richard, Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; May 1997; 114p; In English
Contract(s)/Grant(s): NAG2-716
Report No.(s): ASL-97-3; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Intent information provides knowledge of another aircraft's current and future trajectory states. Prototype traffic displays were designed for four different levels of intent: Position, Rate, Commanded State, and FMS (Flight Management System)-Path. The current TCAS (traffic collision avoidance systems) Display, which shows altitude rate in addition to current position and altitude, was used as a baseline and represents the lowest level of intent. The Rate, Commanded State, and FMS-Path Displays show increasing levels of intent information using TCAS-like symbology in addition to incorporating a conflict probe and profile view display. An initial experiment was run on the MIT (Massachusetts Institute of Technology) Part Task Flight Simulator in which eight airline pilots flew five traffic scenarios with each of the four displays. Results show that pilots had fewer separation violations and maneuvered earlier with the three intent displays. Separation violations were reduced when pilots maneuvered earlier. A second experiment was run to compare performance between displaying intent information directly and incorporating it into a conflict probe. A different set of eight airline pilots flew four traffic scenarios with the TCAS and Commanded State Displays with and without the conflict probe. Conflict probes with two minute and long range look-ahead times were tested. Displaying conflict bands or showing intent information directly both led to fewer separation violations and earlier avoidance maneuvers than the base TCAS Display. Performance was similar between the two minute and long range look-ahead conflict probes. Pilots preferred all intent displays over the TCAS Display.
Author
Air Traffic; Display Devices; Flight Paths; Aircraft Instruments; Flight Instruments

20020030131 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA
Experimental Study of Collision Detection Schema Used by Pilots During Closely Spaced Parallel Approaches
Pritchett, Amy R., Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; Jan. 05, 1996; 44p; In English
Contract(s)/Grant(s): NAG2-716
Report No.(s): ASL-96-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental flight simulator study was conducted to examine the mental alerting logic and thresholds used by subjects to issue an alert and execute an avoidance maneuver. Subjects flew a series of autopilot landing approaches with traffic on a closely-spaced parallel approach; during some runs, the traffic would deviate towards the subject and the subject was to indicate the point when they recognized the potential traffic conflict, and then indicate a direction of flight for an avoidance maneuver. A variety of subjects, including graduate students, general aviation pilots and airline pilots, were tested. Five traffic displays were evaluated, with a moving map TCAS-type traffic display as a baseline. A side-task created both high and low workload situations. Subjects appeared to use the lateral deviation of the intruder aircraft from its approach path as the criteria for an alert regardless of the display available. However, with displays showing heading and/or trend information, their alerting thresholds were significantly lowered. This type of range-only schema still resulted in many near misses, as a high convergence rate was often established by the time of the subject's alert. Therefore, the properties of the intruder's trajectory had the greatest effect on the resultant near miss rate; no display system reliably caused alerts timely enough for certain collision avoidance. Subjects' performance dropped significantly on a side-task while they analyzed the need for an alert, showing alert generation can be a high workload situation at critical times. No variation was found between subjects with and with out piloting experience. These results suggest the design of automatic alerting systems should take into account the range-type alerting schema used by the human, such that the rationale for the automatic alert should be obvious to, and trusted by, the operator. Although careful display design may

help generate pilot/automation trust, issues such as user non-conformance to automatically generated commands can remain a possibility.
Author
Collision Avoidance; Display Devices; Air Traffic; Pilot Performance; Trajectory Analysis

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.

20020027543 NASA Glenn Research Center, Cleveland, OH USA
Noise, Turbulence, and Thrust of Subsonic Free Jets from Lobed Nozzles
Zaman, K. B. M. Q., NASA Glenn Research Center, USA; Wang, F. Y., NASA Glenn Research Center, USA; [2002]; 14p; In English; 40th AIAA Aerospace Sciences Meeting and Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2002-0569; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study of noise benefit, vis-a-vis thrust penalty, and its correlation to turbulence intensities was conducted for free jets issuing from lobed nozzles. Four convergent nozzles with constant exit area were used in the experiments. Three of these were of rectangular lobed configuration having six, ten and fourteen lobes; the fourth was a circular nozzle. Increasing the number of lobes resulted in a progressive reduction in the turbulence intensities as well as in the overall radiated noise. The noise reduction was pronounced at the low frequency end of the spectrum. However, there was an increase in the high frequency noise that rendered the overall benefit less attractive when compared on a scaled-up A-weighted basis. A reduction in noise was accompanied by a commensurate reduction in the turbulent kinetic energy in the flow field. As expected, increasing the number of lobes involved progressive reduction in the thrust coefficient. Among the cases studied, the six-lobed nozzle had the optimum reduction in turbulence and noise with the least thrust penalty.
Author
Convergent Nozzles; Free Jets; Turbulence; Subsonic Flow; Aircraft Noise; Thrust

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.

20020027225 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA
Control Allocation for the Next Generation of Entry Vehicles
Shertzer, Richard H.; Dec. 07, 2001; 116p; In English
Report No.(s): AD-A398505; CI01-311; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Control allocation is the process of assigning control responsibility amongst redundant actuators. A control allocation algorithm for an entry vehicle is presented that uses a linear program to optimally specify bounded aerosurface deflections and jet firings in response to torque commands. Actuator preference is introduced via an objective function to produce a unique solution when the system of linear equations is underdetermined. A multivariable control law is adopted to drive the control allocation algorithm and to track the desired state of the entry vehicle model. Open loop and closed loop tests are conducted to demonstrate dynamic objective calculation, blended aerosurface/jet capability, and efficient reconfiguration in the event of actuator failure. An approach is also presented to define the relationship between systematic errors in measured vehicle state and the actuator commands produced by the control allocation algorithm. Potential control allocation applications beyond the entry problem and other recommendations for further research are stated in the concluding remarks.
DTIC
Aerospace Vehicles; Algorithms; Control Theory; Multivariable Control; Allocations

20020032614 NASA Ames Research Center, Moffett Field, CA USA

An Advanced Fly-By-Wire Flight Control System for the RASCAL Research Rotorcraft: Concept to Reality

Rediess, Nicholas A., NASA Ames Research Center, USA; Dones, Fernando, Boeing Defense and Space Group, USA; McManus, Bruce L., Boeing Defense and Space Group, USA; Ulmer, Lon, Lear Astronics Corp., USA; [1995]; 1p; In English; 14th DASC Digital Systems Conference and Technical Display Conference, 5-9 Nov. 1995, Cambridge, MA, USA

Contract(s)/Grant(s): RTOP 505-59-36; No Copyright; Avail: Issuing Activity; Abstract Only

Design features of a new fly-by-wire flight control system for the Rotorcraft-Aircrew Systems Concepts Airborne Laboratory (RASCAL) are described. Using a UH-60A Black Hawk helicopter as a baseline vehicle, the RASCAL will be a flying laboratory capable of supporting the research requirements of major NASA and Army guidance, control, and display research programs. The paper describes the research facility requirements of these pro-rams and the design implementation of the research flight control system (RFCS), with emphasis on safety-of-flight, adaptability to multiple requirements and performance considerations.
Author

Adaptation; Airborne Equipment; Flight Control; Fly by Wire Control; Rotary Wing Aircraft

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).

20020029722 NASA Glenn Research Center, Cleveland, OH USA

Integration Process for Payloads in the Fluids and Combustion Facility

Free, James M., NASA Glenn Research Center, USA; Nall, Marsha M., NASA Glenn Research Center, USA; [2001]; 12p; In English; Conference and Exhibit on International Space Station Utilization, 15-18 Oct. 2001, Cocoa Beach, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 398-95-00; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Fluids and Combustion Facility (FCF) is an ISS research facility located in the USA Laboratory (US Lab), Destiny. The FCF is a multi-discipline facility that performs microgravity research primarily in fluids physics science and combustion science. This facility remains on-orbit and provides accommodations to multi-user and Principal investigator (PI) unique hardware. The FCF is designed to accommodate 15 PI's per year. In order to allow for this number of payloads per year, the FCF has developed an end-to-end analytical and physical integration process. The process includes provision of integration tools, products and interface management throughout the life of the payload. The payload is provided with a single point of contact from the facility and works with that interface from PI selection through post flight processing. The process utilizes electronic tools for creation of interface documents/agreements, storage of payload data and rollup for facility submittals to ISS. Additionally, the process provides integration to and testing with flight-like simulators prior to payload delivery to KSC. These simulators allow the payload to test in the flight configuration and perform final facility interface and science verifications. The process also provides for support to the payload from the FCF through the Payload Safety Review Panel (PSRP). Finally, the process includes support in the development of operational products and the operation of the payload on-orbit.
Author

Payloads; International Space Station; Microgravity; Destiny Laboratory Module

20020030135 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA

Multi-Agent Flight Simulation with Robust Situation Generation

Johnson, Eric N., Massachusetts Inst. of Tech., USA; Hansman, R. John, Jr., Massachusetts Inst. of Tech., USA; Jan. 27, 1994; 74p; In English

Contract(s)/Grant(s): NAG2-716

Report No.(s): ASL-95-2; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A robust situation generation architecture has been developed that generates multi-agent situations for human subjects. An implementation of this architecture was developed to support flight simulation tests of air transport cockpit systems. This system maneuvers pseudo-aircraft relative to the human subject's aircraft, generating specific situations for the subject to respond to. These pseudo-aircraft maneuver within reasonable performance constraints, interact in a realistic manner, and make pre-recorded voice radio communications. Use of this system minimizes the need for human experimenters to control the pseudo-agents and provides consistent interactions between the subject and the pseudo-agents. The achieved robustness of this system to typical

variations in the subject's flight path was explored. It was found to successfully generate specific situations within the performance limitations of the subject-aircraft, pseudo-aircraft, and the script used.
Author
Flight Simulation; Architecture (Computers); Robustness (Mathematics); Computerized Simulation

20020030257 Air Command and Staff Coll., Maxwell AFB, AL USA
Airports and Spaceports A Historical Comparison
Raymond, John W.; Mar. 1997; 46p; In English
Report No.(s): AD-A398456; AU/ACSC/0368/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)
This study attempts to determine if there are any inferences that can be gleaned from the evolution and operation of airports that can be applied to the current group of spaceports. The author lays the foundation of the study by examining the history of the commercial space industry and the US government's role in supporting that industry. Next, the study focuses on the evolution of airports. Specifically, it traces the roots of the airport back to the early 1900s, describes the impact of WWII (World War II) on the development of the US airport system, and concludes with the most current trend towards airport privatization. With the historical foundation on which to base inferences complete, the author then focuses on the emergence of the commercial spaceport sector. He describes the economics influencing the sector and the DOD (Department of Defense) grant program which provided much needed seed money for spaceport development. He then provides a description of the three spaceports in California, Florida and Alaska. Finally, the author provides background on key issues (ownership, planning, certification, and governmental roles), discusses the airport way, and then makes inferences and recommendations to address the issues.
DTIC
Airports; Launching Sites; Spacecraft Launching; Management

20020032227 Air Command and Staff Coll., Maxwell AFB, AL USA
The Benefits of Simulator Integration to AMC
Thomas, Mark A.; Apr. 1999; 46p; In English
Report No.(s): AD-A398866; AU/ACSC/212/1999-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
The current military budget restrictions create a need to explore alternative ways of training aircrew members. The purpose of this paper is to examine the benefits of simulator integration in Air Mobility Command (AMC) as an alternative training method. The initial discussion is the mandate by the Undersecretary of Defense for Acquisition and Technology to convert all DoD (Department of Defense) simulators to High Level Architecture (HLA). Converting simulators to HLA enables them to interact seamlessly, providing crews the benefit of Distributive Mission Training (DMT). After presenting the current AMC flying hour and simulator program, an explanation and analysis is provided. Next, a notional flying time savings is proposed followed by the obstacles and advantages to substituting simulator time for actual flying time. Finally, the research concludes that not funding HLA/DMT in the FY00 POM (Program Objective Memorandum) was a mistake. There are a few technological obstacles that need to be solved before DMT will be fully functional. However, was consideration given to budget lead times of five to seven years? This must be weighed against Moore's Law which states that micro technology will double every 18 months at the same price. When the obstacles are solved, DMT promises to provide better, more efficient training at a significant cost reduction. Because DMT can provide better prepared crews for combat, the progress of DMT must be followed closely to determine if and when it becomes a viable training method.
DTIC
Systems Integration; Flight Simulators; Armed Forces (USA); Defense Program

20020032310 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA
A Graphical Workstation Based Part-Task Flight Simulator for Preliminary Rapid Evaluation of Advanced Displays
Wanke, C., Massachusetts Inst. of Tech., USA; Kuchar, J., Massachusetts Inst. of Tech., USA; Hahn, E., Massachusetts Inst. of Tech., USA; Pritchett, A., Massachusetts Inst. of Tech., USA; Hansman, R. J., Massachusetts Inst. of Tech., USA; [1992]; 7p; In English; SAE Aerotech Conference and Exposition, 5-8 Oct. 1992, Anaheim, CA, USA; Sponsored by Society of Automotive Engineers, Inc., USA; Previously announced as 19940035336
Contract(s)/Grant(s): BARR-10-119; DTRS57-88-C-0078; NGL-22-009-640; NAG2-12; NAG2-716; NAG1-690; NSF MSS-85-52702; Copyright; Avail: Issuing Activity
Advances in avionics and display technology are significantly changing the cockpit environment in current transport aircraft. The MIT Aeronautical Systems Lab (ASL) has developed a part-task flight simulator specifically to study the effects of these new technologies on flight crew situational awareness and performance. The simulator is based on a commercially-available graphics workstation, and can be rapidly reconfigured to meet the varying demands of experimental studies. The simulator has been

successfully used to evaluate graphical microburst alerting displays, electronic instrument approach plates, terrain awareness and alerting displays, and ATC routing amendment delivery through digital datalinks.
Author
Flight Simulators; Display Devices; Workstations; Avionics; Graphical User Interface

20020032687 NASA Ames Research Center, Moffett Field, CA USA
Arcjets for Aerodynamic and Materials Testing: Flow Characterization
Sharma, Surendra P., NASA Ames Research Center, USA; Fletcher, Doug, NASA Ames Research Center, USA; [1995]; 1p; In English; 34th AIAA Aerospace Sciences Meeting, Jan. 1996, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 313-00-00; No Copyright; Avail: Issuing Activity; Abstract Only

Potential use of Arcjets as a hypersonic ground test facility for aerodynamic testing of future space vehicles is examined. Since high fidelity simulation of flight freestream conditions is a basic requirement for any useful ground test facility, it is imperative that the Arcjet flow field be thoroughly investigated in a systematic and orderly manner. At the same time we must know how and to what extent an inaccurate simulation of the flight freestream will effect the test data. The paper after discussing these two topics, describes various experimental techniques for Arcjet flow characterization. Results from an on-going Arcjet flow characterization program are also presented.
Author
Arc Jet Engines; Wind Tunnel Tests; Aerodynamic Characteristics; Free Flow; Aerospace Vehicles

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.

20020028167 Air Command and Staff Coll., Maxwell AFB, AL USA
Space Power Theory: A Rising Star
Jusell, Judson J.; Apr. 1998; 82p; In English
Report No.(s): AD-A398543; AU/ACSC/144/1998-04; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Is there a single comprehensive theory that could shape future space and air forces? This essay examines the current state of space power theory. The method of research was a literature review of books, periodicals, government and private reports, and conference proceedings via Air University Library and the Internet, as well as personal contact with faculty members from several military schools. This effort identified basic elements of military theory-definitions, explanations and predictions-which then became a qualification as well as a framework for this paper. The major findings of this paper are that: (1) Space power theory is emerging: it exists and is growing in the form of definitions, explanations and predictions of the nature, significance and functioning of systems in space; (2) A single comprehensive space power theory does not exist; and (3) Space power theory has much room for improvement in its definitions, explanations and predictions of space power. Finally, this paper recommends that future theorists: (1) Expand all areas of space power theory to create a more robust body of literature; (2) Thoroughly examine the contributions of early space theorists (see Chapter 3, Note 1); (3) Address, in detail, the two 'hot topics' in space power theory today-space control and space force organization; and (4) Seek a single comprehensive space power theory to bring together the lasting ideas of space power for the purpose of shaping future space forces.
DTIC
Internets; Qualifications; Schools; Military Technology; Aerospace Engineering

20020030269 Air Command and Staff Coll., Maxwell AFB, AL USA
Access to Space: Routine, Responsive and Flexible Implications for an Expeditionary Air Force
Parker, Dewey; Apr. 1999; 54p; In English; Original contains color images
Report No.(s): AD-A397496; AU/ACSC/154/1999-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

The USA Air Force is implementing the Expeditionary Air Force (EAF) construct. Concurrently, technological, political, and economic forces are driving the rapid development of routine, responsive and flexible access to space. This paper presents the argument that routine access to space will happen more quickly than is presently forecast and therefore the transition to an

EAF should address the implications of routine space access. The research methodology included literature searches in the areas of air and space doctrine, Reusable Launch Vehicle (RLV) development, EAF constructs, and command and control relationships within the joint force. The congressional record was searched for relevant legislation and legislative proposals. Interviews with EAF and space experts were conducted. Exercises and games such as Expeditionary Forces Exercise (EFX) 98 and Global Engagement 98 were analyzed. The Air Force must quickly develop doctrine and command relationships designed to maximize the contributions routine space access brings to the joint warfighter. Doctrinal constructs for the effective use of USAF expeditionary aerospace power will help ensure our nation maintains its lead as the preeminent aerospace power. This paper specifically uses the near-future advent of Reusable Launch Vehicles and their implications for an Expeditionary Air Force as an illustration of how future Joint Force Commanders may effectively bring aerospace power to bear in the battlespace as a combined, synergistic whole.
DTIC
Games; Space Exploration; Military Technology; Aerospace Environments

20020030271 Air Command and Staff Coll., Maxwell AFB, AL USA
Joint Command, Control, and Communications (C3) Under One Roof
Mills, Diane M.; Mar. 1997; 53p; In English; Original contains color images
Report No.(s): AD-A397883; AU/ACSC/0595/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

Can one joint command, control, and communications (C3) platform replace five or more current C3 platforms and achieve the same results or better? Can we save money in the long run by concentrating our efforts on one global C3 system versus the continual research, development, and testing to extend the life of our present air-breathing platforms? These C3 platforms include ground units such as the Air Force ground Modular Control Element (MCE) and airborne units such as the Airborne Warning and Control System (AWACS), Joint Surveillance Targeting and Radar System (JSTARS), and Airborne Battlefield Command, Control, and Communications (ABCCC); as well as our naval counterpart the E-2C Hawkeye. Presently, these units fall under different services, different commands, and speak different techno-babble languages when in fact they all serve the same purpose: relay of real-time information to the battlefield for the decision makers. Can we afford to continue using multiple platforms to achieve the same goal? Can technology not deliver the required information in one package? This research explores two concepts: the feasibility of combining current C3 platforms currently used in the USAF and USN and using commercial space-based satellite technology as the host for joint connectivity.
DTIC
Command and Control; Systems Integration; AWACS Aircraft; Surveillance Radar

20020030278 Air Command and Staff Coll., Maxwell AFB, AL USA
Gray Space and the Warfighter
Burlingame, James M.; Holguin, Juan D.; Newman, Timothy R.; Ryan, Colleen M.; Mar. 1997; 18p; In English
Report No.(s): AD-A397906; AU/ACSC/0563/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

The emerging commercial satellite industry is posing unique problems to the US warplanner. Gray Space is defined as those satellite systems available to the general populace that could potentially be used against the US and its allies for hostile purposes. This hypertext markup language (HTML) research project explores this issue. The project is divided into four sections: (1) US Space Capabilities, Roles and Systems (2) Use of Space in Desert Storm (3) Gray Space Satellite Systems and (4) Theater Planning. Section one begins by pointing out there is no official US space doctrine published. However, the generally accepted four space roles of Space Control, Force Enhancement, Space Support and Force Application are discussed. The second section looks at the use of space systems during the Gulf War. The issues of what needs to be done to better integrate space into all facets of air operations is discussed. In addition, it highlights how planners must understand how space can help them better observe the battlefield and make more timely operational planning decisions. The third section of the HTML provides background on numerous Gray Space systems, including images and text describing missions, satellite summaries, and basic descriptions of goods and services. The fourth section highlights the challenges Gray Space assets have on theater war planners. In the conclusion the concept of Gray Space is summarized. Gray Space is the predominant threat to continued USA control of space. The conclusion ends with a discussion of how the warfighter could potentially combat the Gray Space threat, although no real easy answers exist.
DTIC
Aerospace Systems; Warfare; Military Operations; Artificial Satellites

20020030289 Air Command and Staff Coll., Maxwell AFB, AL USA

Space Dominance Can the Air Force Control Space?

Stapp, Richard S.; Mar. 1997; 45p; In English

Report No.(s): AD-A398457; AU/ACSC/0370/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Air Force, as part of its vision for the 21st century, has declared Space Dominance and Space Control as new military objectives. It is not clear if the Air Force understands the difficulties associated with dominating the space environment, but several issues have yet to be resolved. While the requirements for achieving space control are numerous, three stand out as especially critical: sound doctrine, viable technology, and political resolve. Doctrine provides our basis for employing forces and waging war. Without strong space doctrine, space control will likely meet with less than successful results. Technology is the linchpin which allows space operations to be achievable and effective. Without the required technology, space control is impossible. Politics is the last and most critical requirement in achieving space control. Neither doctrine nor technology can compensate for the lack of political resolve. Without it, all other efforts are futile. This paper discusses the doctrinal, technical and political difficulties of achieving space control as well as other issues which complicate the space control mission. Based on the analysis of these elements, a determination is made as to the feasibility of effectively implementing a space control policy.

DTIC

Armed Forces (USA); Aerospace Environments; Military Operations

20020031749 Air Command and Staff Coll., Maxwell AFB, AL USA

Space Force 2020: A Force for the Future

Lootens, Steven R.; Apr. 1998; 53p; In English; Original contains color images

Report No.(s): AD-A398579; AU/ACSC/170/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

This paper presents a conceptual analysis of the environment, shaping and answering the following questions: When should the transition of the United States Air Force to a space and air force begin in earnest? What future capabilities of Air Force space power should the nation demand? How, considering the inherent characteristics of active duty, Reserve, Air National Guard, civil service, and contractors, should the Air Force organize and create its future space force? The analysis recognizes there will not be a true global or regional competitor for the next 10 to 15 years, while the threats in the 2010 to 2020 time frame will be very different from what the US faces today. The priority, therefore, for transformation must go to responding now to asymmetric challenges and to the transition to space. The Air Force has the time and opportunity to begin the transition today. It cannot afford to wait. The required space capabilities for the future space and air force stem from strategy, Air Force core competencies, and Air Force doctrine. Some capabilities already exist in space asset detection, tracking, identification, and characterization as well as in space environment characterization, space-based navigation, communications, reconnaissance, surveillance, threat warning, and environmental sensing, battle management/command and control, scheduled launch operations, satellite telemetry, tracking, and commanding (TT&C), and mission data distribution. These capabilities only require upgrades and improvements to fully leverage new information technologies. Other capabilities could exist with the right investment and procurement decisions terrestrial-based space asset deception, disruption, denial, degradation, and destruction, space asset protection, vulnerability reduction, and survivability enhancement, unscheduled launch operations.

DTIC

Aerospace Systems; Aerospace Environments; Armed Forces (USA); Military Operations

20020031751 Air Univ., Maxwell AFB, AL USA

Space Doctrine for the 21st Century

Newberry, Robert D.; Mar. 1997; 96p; In English

Report No.(s): AD-A398606; AU/ACSC/0427/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

Today there is virtually no approved space doctrine to guide the development and employment of space forces. The supporting strategies for organizing, training, equipping, and employing space forces do not exist. There is no discussion of the tenets of space power or the operational art of employing space forces. Space policy has emerged to fill the doctrinal void. Policy is the major influence on the organization, training, equipping, and employment of U.S. space forces. The preeminence of policy and absence of doctrine has caused military effectiveness to be muted in the debates over space forces. Without a clear vision of what space forces should do, the Air Force has been left to build space forces in an ad hoc manner. There is no doctrinal guidance for how to achieve the offensive and defensive mix of forces called for in the national space policy and there is no approved process from which the needed doctrine can be developed. Although doctrine development follows a proscribed bureaucratic process, little consideration is given to the underlying thought process. This paper attempts to define a doctrine development process and use

it to formulate a space doctrine. This doctrine includes the tenets of space power, the operational art of space warfare, and implementation strategies for space forces. This doctrine can be immediately applied to ongoing space operations.
DTIC
Policies; Aerospace Systems; Armed Forces (USA); Management

20020032332 Air Force Space Command, Peterson AFB, CO USA
USSPACECOM Briefing - Advanced Concept Technology Demonstration
Breidenbach, Teresa; Dec. 07, 2001; 7p; In English
Report No.(s): AD-A398799; No Copyright; Avail: Defense Technical Information Center (DTIC)
Space and information are mediums of warfare. Increased dependence on space and information lead to increased vulnerabilities. USSPACECOM Vision 2020 Themes: Dominate the space medium and integrate space power throughout military operations. New Missions: Control of Space, Force Enhancement, Computer Network Defense/Attack.
DTIC
Aerospace Systems; Vulnerability; Warfare; Armed Forces (USA)

13
ASTRODYNAMICS

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

20020027244 Lockheed Martin Advanced Technology Center, Palo Alto, CA USA
Intelligent Training Development Methodologies ***Final Report, Apr. 1993-Jan. 1996***
Stiles, R. J.; Jul. 2001; 47p; In English
Contract(s)/Grant(s): F41624-93-C-5000; Proj-1123
Report No.(s): AD-A398477; AFRL-HE-AZ-TR-2000-0163; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This research effort developed an immersed virtual environment for the instruction of orbital mechanics and Training Studio, a more general virtual environment instructional authoring system. Training Studio provides the instructor with the capability of developing instructional simulations and not needing a computer programmer to translate instructional objectives into code. It provides the instructor with a visual programming system that operates the virtual environment. In a Training Studio session, there can be several processes handling interaction and display of the virtual environment (Vista Viewer), several processes modeling the understanding of the participants (Training Assistant), and several processes controlling the simulation and visual aspect of individual objects (Agent Framework and Profiler). Suggestions for further evolution of this type of software are provided.
DTIC
Training Devices; Computer Assisted Instruction; Virtual Reality; Orbital Mechanics

20020027700 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA
Autonomous Orbital Rendezvous Using Angles-Only Navigation
Chari, Raja J.; Dec. 07, 2001; 198p; In English
Report No.(s): AD-A398511; CI01-308; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
This study assesses navigation performance for rendezvous and close approach applications where on-board navigation must be accomplished through the use of angles-only measurements by developing various relative motion orbital trajectories. Chaser vehicle maneuvers designed to enhance the estimator's observability of the downrange distance to the target are considered. The target vehicle is assumed to be non-maneuvering and in a near-circular orbit. The modeled system includes representative scenarios from the Orbital Express mission. Although a wide array of angle measurement sensors are available, their use in orbital rendezvous is generally limited by the fact that they are unable to provide direct target ranging information which leads to significant downrange error accumulation in the navigation filter. These navigation problems inherent to angles-only measurements in a natural motion environment are first qualitatively studied both analytically and through linear covariance modeling. It is shown that different target-chaser geometries lead to different navigation uncertainties in target downrange distance. The conclusions drawn from considering natural motion geometries are used to study candidate maneuver-assisted trajectories. The results from this study are used to select and combine the most promising maneuver-assisted trajectories for more in-depth consideration as potential scenarios for the Orbital Express mission. These selected trajectories are then analyzed in depth to determine the interdependency of range observability using angles-only navigation with angular sensor quality, inertial measurement accuracy, attitude determination accuracy, and trajectory design. Using the Orbital Express mission as a baseline,

maneuver-assisted trajectories for angles-only navigation are tested with realistic error models to validate the rules of thumb created for improved angles-only navigation even in the presence of biases, misalignments, and degraded sensors.
DTIC
Orbital Rendezvous; Autonomous Navigation; Mathematical Models; Autonomy

20020030820 Naval Postgraduate School, Monterey, CA USA
Analysis of a Magnetic Three-Axis Stabilized Attitude Control System for the NPSAT1 Spacecraft
Zirkle, Todd A.; Sep. 30, 2001; 111p; In English
Report No.(s): AD-A397962; No Copyright; Avail: Defense Technical Information Center (DTIC)
The NPSAT1 satellite uses an active magnetic torque rod system, with a magnetometer for attitude determination, to maintain 3-axis stabilization, with a slightly gravity gradient friendly structure, This thesis will examine the performance of three combinations of programs and simulation models for the NPSAT1 satellite attitude control system. The models include a magnetic control law with a reduced order estimator to generate torque commands to achieve spacecraft nadir pointing and a magnetic rate (Bdot) control law to reduce spacecraft angular rates. The performances of two Bdot mode switching designs are compared Also, a case is made for the benefits of performing the system's reduced estimator prior to mode switching. All of the control methods analyzed appear to be valid control methods to achieve three-axis attitude stabilization using only magnetic torquers for active control. The most efficient control method analyzed incorporates a hand-off method from a magnetic rate (Bdot) control loop to a magnetic control loop. The results of this analysis indicates that the best use of this method is to perform the Bdot hand-off following the achievement of a predetermined combined angular rate.
DTIC
Magnetic Fields; Satellite Attitude Control; Magnetic Control; Attitude (Inclination)

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.

20020029728 Army Research Lab., Aberdeen Proving Ground, MD USA
A Spice-Based Code for ARL's 4.5-MJ Electromagnetic Launcher Pulsed Power Supply System ***Final Report, Oct. 2000 - Jun. 2001***
Guercio, Miguel D., Army Research Lab., USA; Sep. 2001; 54p; In English; Original contains color images
Report No.(s): AD-A398467; ARL-TR-2592; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A Spice-based code (Ispice/4Rx) is used to simulate the U.S. Army Research Laboratory's (ARL's) 4.5-MJ pulsed power supply (PP S) discharge into an EM (electromagnetic) railgun. The code determines the in-bore projectile position, voltage, and current at the breech, and exit current and velocity at the muzzle exit The code also includes a diffusion model of the railgun rails. The code's primary inputs are the charging voltage to the PPS capacitor banks and the parameters for the different inductive and resistive components of the system which model its hardware. The railgun parameters were chosen to reflect current hardware and program requirements.
DTIC
Railgun Accelerators; Computerized Simulation

20020030821 Air War Coll., Maxwell AFB, AL USA
The Transition to a Space and Air Force Proposed Solution to the Dilemma
Clark, D. T.; Apr. 1997; 71p; In English; Original contains color images
Report No.(s): AD-A398238; AU/AWC/RWP030/97-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
War will someday occur in space. History supports the argument that humans have never encountered a medium they could occupy without fighting wars in it for one reason or another. Space will be no different. Who will reign supreme in this new medium of warfare? The Air Force has laid claim to the role of superior military force in space by committing to a transition from an air force to an air and space force on an evolutionary path to a space and air force. First, however, the Air Force must solve significant problems in doctrine, leadership, technology and funding. This paper addresses each of these areas, identifying weaknesses and proposing solutions in each area. Doctrine must address the unique characteristics of the space medium and commit to establishing an offensive space-based capability. The Air Force has not prepared enough officers experienced in space operations to serve at the flag rank, and that record must be reversed. Several key enabling technologies must be pursued, but none more than those

providing assured, affordable access to space. Finally, the Air Force must take the lead in restructuring existing forces, recognizing the potential offensive capability of space-based systems, and seeking a $30 billion annual increase in space spending by 2005. If the Air Force acts on these recommendations, it will ensure its transition to a space and air force is accomplished successfully and in time to prepare for eventual conflict in space.
DTIC
Military Operations; Warfare

20020030826 Air War Coll., Maxwell AFB, AL USA
Command and Employment of Space Power: Doctrine for the Asymmetric Technology of the 21st Century
Bell, Thomas D.; Apr. 1997; 59p; In English
Report No.(s): AD-A398246; AU/AWC/RWP011/97-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

It is inevitable that mankind will weaponize space and likely this weaponization will take place in the next thirty years. The USA is in the early stages of a transition from using space assets to support combat operations on the surface of the earth to using space assets to conduct combat operations in space, from space, and through space. This paper discusses factors driving the USA to take its first steps to weaponize space. It is the time for the Air Force to start building the doctrinal framework for combat operations in, from, and through space to guide the technological development of space assets as the doctrine of strategic bombardment guided Air Force thought and aircraft development prior to World War II. This paper discusses the transition from an air to a space force by examining required changes to Air Force doctrine within the framework of its six core competencies if the Air Force is to organize, train, and equip aerospace forces to conduct combat operations in the space environment.
DTIC
Space Weapons; Military Operations; Warfare

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.

20020028932 NASA Johnson Space Center, Houston, TX USA
STS-109 Flight Day 1 Highlights
Mar. 01, 2002; In English; Videotape: 20 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002043979; BRF-1432A; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

While in orbit around Earth, the crew of STS-109 aboard the Columbia Orbiter will service the Hubble Space Telescope (HST) in five extravehicular activities (EVA). In this video, prelaunch activities are shown including the positioning of the astronauts in their seats prior to liftoff. Liftoff is also shown, as is the escape flight. A comment is also made concerning the announcement shortly after liftoff that there was restricted flow in one of two freon loops in the Orbiter's radiator.
CASI
Astronauts; Columbia (Orbiter); Spacecraft Launching; Hubble Space Telescope

20020029262 NASA Johnson Space Center, Houston, TX USA
STS-109 Flight Day 3 Highlights
Mar. 03, 2002; In English; Videotape: 30 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002043977; BRF-1432C; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

This footage from the third day of the STS-109 mission to service the Hubble Space Telescope (HST) begins with the grappling of the HST by the robotic arm of the Columbia Orbiter, operated by Mission Specialist Nancy Currie. During the grappling, numerous angles deliver close-up images of the telescope which appears to be in good shape despite many years in orbit around the Earth. Following the positioning of the HST on its berthing platform in the Shuttle bay, the robotic arm is used to perform an external survey of the telescope. Some cursory details are given about different equipment which will be installed on the HST including a replacement cooling system for the Near Infrared Camera Multi-Object Spectrometer (NICMOS) and the Advanced Camera for Surveys. Following the survey, there is footage of the retraction of both of the telescope's two flexible solar

arrays, which was successful. These arrays will be replaced by rigid solar arrays with decreased surface area and increased performance.
CASI
Hubble Space Telescope; Robot Arms; Solar Arrays; Spacecraft Docking

20020029263 NASA Johnson Space Center, Houston, TX USA
STS-109 Flight Day 4 Highlights
Mar. 04, 2002; In English; Videotape: 36 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002043976; BRF-1432D; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-109 Payload Commander John Grunsfeld and Mission Specialist Richard Linnehan are seen suiting up in preparation for their spacewalk with the assistance of Mission Specialists Michael Massimino and James Newman. Linnehan and Grunsfeld move the old solar arrays from the Hubble Space Telescope (HST) into the cargo bay of the Columbia Orbiter for storage. Grunsfeld is seen maneuvering around the HST to remove the connections to the diode box controller. Linnehan is seen controlling the new rigid solar array as he moves it into position onto the HST and Grunsfeld locks it into place. Footage is shown of Linnehan unfolding the solar array and Grunsfeld attaching the cables to the diode box controller to supply power to the solar array. Scenes of the HST with its new starboard rigid solar array are shown. The video concludes with footage of the activities of Nancy Currie, James Newman, and Michael Massimino during the spacewalk.
CASI
Extravehicular Activity; Hubble Space Telescope; Solar Arrays; Crew Procedures (Inflight)

20020029264 NASA Johnson Space Center, Houston, TX USA
STS-109 Flight Day 2 Highlights
Mar. 02, 2002; In English; Videotape: 18 min. 5 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002043975; BRF-1432B; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Footage shows the cargo bay of the Columbia Orbiter, including the rigid array carrier, the solar arrays to be installed on the Hubble Space Telescope, and the robotic arm. Close-up shots show several components of the flight support system. STS-109 Commander Scott Altman, Payload Commander John Grunsfeld, and Mission Specialist Nancy Currie are seen on the flight deck, and they answer questions about the stabilization of the freon flow, details of the upcoming rendezvous and capture of the Hubble Space Telescope, the scheduled spacewalks, and the social dynamics of the flight crew.
CASI
Columbia (Orbiter); Solar Arrays; Robot Arms; Support Systems

20020029884 NASA Johnson Space Center, Houston, TX USA
STS-109 Flight Day 7 Highlights
Mar. 07, 2002; In English; Videotape: 32 min. 30 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002045007; BRF-1432G; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

The Hubble Space Telescope (HST) is seen on its berthing platform on the rear of the cargo bay of the Columbia Orbiter. Additional footage shows the port solar array of the HST as well as the area where the new thermal blanket was installed. Mission Specialists James Newman and Michael J. Massimino are performing their spacewalk. The footage includes Newman unbolting and sliding out the Faint Object Camera, moving it into storage, then lifting the Advanced Camera for Surveys (ACS) out of the cargo bay, and Massimino installing the ACS. The second stage of their spacewalk shows Newman retrieving the Electronic Support Module out of the cargo bay, and assisting Massimino as he installs the module and its connectors in front of the ACS. As they return to Columbia, additional members of the crew are seen preparing spacesuits for the following day's spacewalk and cleaning the seals on the airlock. The video concludes with Pilot Duane G. Carey interviewing Massimino about his spacewalk using internet questions from school children.
CASI
Extravehicular Activity; Columbia (Orbiter); Hubble Space Telescope; Crew Procedures (Inflight); Spacecraft Maintenance

20020029885 NASA Johnson Space Center, Houston, TX USA
STS-109 Flight Day 9 Highlights
Mar. 09, 2002; In English; Videotape: 30 min. 12 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2002047889; BRF-1432I; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Footage shows the Hubble Space Telescope (HST) against a backdrop of Earth. The grappling of the HST with the robotic arm is seen, and payload bay cameras show different angles of the HST in its deploy orientation. The deployment of the HST from the Columbia Orbiter is seen, followed by footage of the HST flying freely over the Earth's horizon. All seven crew members are gathered together during an in-flight interview as they answer questions about the mission, the experiences of being in space, and their lives as astronauts. Additional footage of the crew working during the deployment of the HST is shown. Duane Carey is seen interviewing Nancy Currie with Internet questions from young students. The video concludes with the view from Columbia of the Pacific Ocean, the coast of Northwestern Chile, and a sunrise.

CASI

Hubble Space Telescope; Columbia (Orbiter); Crew Procedures (Inflight)

20020030205 NASA Johnson Space Center, Houston, TX USA

STS-109 Flight Day 5 Highlights

Mar. 05, 2002; In English; Videotape: 30 min. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2002044999; BRF-1432E; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On the fifth day of the STS-109 mission, the crewmembers and Commander Scott Altman of the Columbia Orbiter are shown in their servicing mission to the Hubble Space Telescope (HST). Selected footage is presented of the extravehicular activities (EVA) of Mission Specialists Jim Newman and Mike Massimino, who installed a new port solar array on the HST. Information is presented on the size and power capacity of the array. The reaction wheel assembly, one of four gyroscopic devices used to maneuver the HST, is also shown being replaced by the astronauts. A new insulation blanket panel was also installed at the end of the spacewalk because the astronauts had extra time.

CASI

Extravehicular Activity; Hubble Space Telescope; Reaction Wheels; Solar Arrays; Thermal Insulation; Space Maintenance; Spacecraft Maintenance

20020030206 NASA Johnson Space Center, Houston, TX USA

STS-109 Flight Day 6 Highlights

Mar. 06, 2002; In English; Videotape: 33 min. 4 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2002046548; BRF-1432F; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

On the sixth flight day of the STS-109 mission, the crewmembers of the Columbia Orbiter (Commander Scott Altman, Pilot Duane Carey, Payload Commander John Grunsfeld, and Mission Specialists Nancy Currie, James Newman, Richard Linnehan, and Michael Massimino) are shown in selected footage of their servicing mission to the Hubble Space Telescope (HST). The third of five extravehicular activities (EVA) is performed in which Linnehan and Grunsfeld replaced the HST's Power Control Unit (PCU). The astronauts' egress from the Orbiter was delayed after water was found in Grunsfeld's suit. The removal of the old unit was particularly difficult, given the difficulty of demating the PCU's 36 connectors encumbered by the heavy gloves of the astronaut's suit. During this space walk, the HST was powered down to a completely dormant state for the first time since its launch in 1990. Following the successful installation of the new PCU, the HST's power was restarted by engineers at the Goddard Space Flight Center (GSFC). There had been some concern about the telescope's possible failure to restart, but everything went smoothly.

CASI

Control Equipment; Extravehicular Activity; Hubble Space Telescope; Spacecraft Maintenance

20020030208 NASA Johnson Space Center, Houston, TX USA

STS-109 Flight Day 10 Highlights

Mar. 10, 2002; In English; Videotape: 29 min. 5 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2002047888; BRF-1432J; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Footage shows the view of Earth from the Columbia Orbiter. A video conference of the crew members of STS-109 (Commander Scott Altman, Pilot Duane Carey, Payload Commander John Grunsfeld, and Mission Specialists Nancy Currie, James Newman, Richard Linnehan, and Michael Massimino) and of the International Space Station is seen as they discuss and share their experiences in space. Carey and Currie are seen as they answer questions sent from school children. Additional footage

of the view of Earth is shown as the crew members answer more questions about the mission during an on-orbit interview. The view of the Hubble Space Telescope in the distance is seen. The video concludes with a view of the Galapagos Islands.
CASI
Earth Observations (From Space); Spacecrews

20020030739 NASA Johnson Space Center, Houston, TX USA
STS-105 Mission Highlights Resource Tape: Flight Days 4-6, Part 2 of 4
Mar. 05, 2002; In English; Videotape: 56 min. 28 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002046549; JSC-1899; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

A continuation of 'STS-105 Mission Highlights Resource Tape: Flight Days 1-3' (internal ID 2002046550), this video shows footage from flight days four through six of the STS-105 mission. Commander Scott Horowitz helps Mission Specialist Pat Forrester maneuver the Space Shuttle's robotic arm as it grapples the Multipurpose Logistics Module (MPLM) from Discovery's payload bay to the International Space Station (ISS). The three crews, STS-105 (Commander Horowitz, Pilot Fred Sturckow, and Mission Specialists Dan Barry and Forrester), Expedition 2 (Commander Yuriy Usachev and Flight Engineers James Voss and Susan Helms), and Expedition 3 (Commander Frank Culbertson, Jr. and Flight Engineers Mikhail Turin and Vladimir Dezhurov), are seen during unloading operations as they transfer equipment from the MPLM to the ISS. Forrester and Barry check their equipment and suits for the next day's spacewalks. The E2 crew shows the E3 crew around ISS. The crescent moon and the end of a sunset are seen from space. For activities from flight days 7-13, see 'STS-105 Mission Highlights Resource Tape: Flight Days 7-9' (internal ID 2002046552) and 'STS-105 Mission Highlights Resource Tape: Flight Days 10-13' (internal ID 2002046551).
CASI
International Space Station; Spacecrews; Loading Operations; Crew Procedures (Inflight); Space Station Modules

20020030740 NASA Johnson Space Center, Houston, TX USA
STS-105 Mission Highlights Resource Tape: Flight Days 7-9, Part 3 of 4
Mar. 05, 2002; In English; Videotape: 1 hr. 30 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002046552; JSC-1899; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

A continuation of 'STS-105 Mission Highlights Resource Tape: Flight Days 1-3' (internal ID 2002046550) and 'STS-105 Mission Highlights Resource Tape: Flight Days 4-6' (internal ID 2002046549), this video shows footage from flight days seven through nine of the STS-105 mission. Mission Specialists Dan Barry and Pat Forrester are seen preparing for and performing their spacewalks, where they install an Early Ammonia Servicer on the International Space Station (ISS). The Expedition 2 crew (Commander Yuriy Usachev and Flight Engineers James Voss and Susan Helms) hands control of the ISS over to the Expedition 3 crew (Commander Frank Culbertson, Jr. and Flight Engineers Mikhail Turin and Vladimir Dezhurov) in a short ceremony. Barry and Forrester return to space the next day for another spacewalk to install handrails and heater cables. Hawaii is seen from space as ISS passes over, and the smoke from forest fires in Oregon and Idaho is shown. For footage from flight days 10-13, see 'STS-105 Mission Highlights Resource Tape: Flight Days 10-13' (internal ID 2002049551).
CASI
Extravehicular Activity; International Space Station; Orbital Servicing; Crew Procedures (Inflight)

20020030741 NASA Johnson Space Center, Houston, TX USA
STS-105 Mission Highlights Resource Tape: Flight Days 10-13, Part 4 of 4
Mar. 05, 2002; In English; Videotape: 1 hr. 12 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002046551; JSC-1899; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

A continuation of 'STS-105 Mission Highlights Resource Tape: Flight Days 1-3' (internal ID 2002046550), 'STS-105 Mission Highlights Resource Tape: Flight Days 4-6' (internal ID 2002046549), and 'STS-105 Mission Highlights Resource Tape: Flight Days 7-9' (internal ID 2002046552), this video shows footage from flight days 10 through 13 of the STS-105 mission. The Multipurpose Logistics Module (MPLM) is moved from the International Space Station (ISS) to the payload bay of Discovery. The STS-105 crew (Commander Scott Horowitz, Pilot Fred Sturckow, and Mission Specialists Dan Barry and Pat Forrester) and Expedition 2 crew (Commander Yuriy Usachev and Flight Engineers James Voss and Susan Helms) bid farewell to the Expedition 3 crew (Commander Frank Culbertson, Jr. and Flight Engineers Mikhail Turin and Vladimir Dezhurov), who are to remain on

ISS. ISS is seen against the Earth as Discovery performs its fly-around after the orbiter undocks. There is no flight day footage from flight day 12. Discovery is seen landing.
CASI
International Space Station; Spacecrews; Spacecraft Docking; Crew Procedures (Inflight); Discovery (Orbiter)

20020030742 NASA Johnson Space Center, Houston, TX USA
STS-105 Mission Highlights Resource Tape: Flight Days 1-3, Part 1 of 4
Mar. 04, 2002; In English; Videotape: 1 hr. 15 min. 7 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002046550; No Copyright; Avail: CASI; B04, Videotape-Beta; V04, Videotape-VHS

An overview of the STS-105 mission is given through footage of each flight day. Scenes from flight days one through three show activities such as astronaut prelaunch procedures (breakfast, suit-up, and boarding Discovery), the launch from multiple vantage points, and various on-orbit activities. Expedition 3 (E3) Commander Frank Culbertson, Jr. and Flight Engineer Mikhail Turin perform the H-Reflex Experiment, an experiment to test the effects of microgravity on the human spinal cord. As Discovery approaches the International Space Station (ISS), the Expedition 2 (E2) crew, Commander Yuriy Usachev and Flight Engineers James Voss and Susan Helms, are seen working in the Destiny Laboratory Module aboard ISS. Discovery docks to the space station and the three crews (STS-105, E2, and E3) greet each other after the hatches between the orbiter and ISS are opened. As Discovery passes over the USA, Utah, Wyoming, South Dakota, and Minnesota are seen through patchy clouds. Footage from flight days 4-13 can be found on 'STS-105 Mission Highlights Resource Tape: Flight Days 4-6' (internal ID 2002046549), 'STS-105 Mission Highlights Resource Tape: Flight Days 7-9' (internal ID 2002046552), and 'STS-105 Mission Highlights Resource Tape: Flight Days 10-13' (internal ID 2002046551).
Derived from text
International Space Station; Spacecraft Launching; Spacecrews; Crew Procedures (Preflight); Crew Procedures (Inflight)

20020030743 NASA Johnson Space Center, Houston, TX USA
STS-109 Flight Day 8 Highlights
Mar. 08, 2002; In English; Videotape: 41 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002047890; BRF-1432H; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

Footage of the eighth day of STS-109 is shown during which Mission Specialists John Grunsfeld and Rick Linnehan service the Hubble Space Telescope (HST). A broad overview of the Columbia Orbiter mission is presented. On the fifth extravehicular activity (EVA) of the mission, Grunsfeld and Linnehan installed a new cryogenic cooling system and radiator on HST for NICMOS (Near Infrared Camera and Multi-Object Spectrometer) which had not been previously operational due to the failure of an earlier cooling system. Linnehan and Grunsfeld are both shown on the end of the Orbiter's robot arm, the Remote Manipulator System, which was controlled by Commander Scott Altman. Following the completion of their spacewalks, the two Mission Specialists make statements which include thanking the numerous support personnel. Linnehan answers questions on the differences between training simulation at facilities such as the Neutral Buoyancy Lab (NBL) and his actual experiences in space.
CASI
Cooling Systems; Cryogenic Cooling; Extravehicular Activity; Hubble Space Telescope; Space Maintenance; Heat Radiators; Spacecraft Maintenance

20020030755 NASA Johnson Space Center, Houston, TX USA
STS-110 Crew Interviews: Lee Morin
Mar. 12, 2002; In English; Videotape: 42 min. 10 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002049337; JSC-1909E; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-110 Mission Specialist Lee Morin is seen during this preflight interview, where he gives a quick overview of the mission before answering questions about his inspiration to become an astronaut and his career path. Morin outlines his role in the mission in general, and specifically during the docking and extravehicular activities (EVAs). He describes the payload (S0 Truss and Mobile Transporter) and the dry run installation of the S0 truss that will take place the day before the EVA for the actual installation. Morin discusses the planned EVAs in detail and outlines what supplies will be left for the resident crew of the International Space Station (ISS). He ends with his thoughts on the most valuable aspect of the ISS.
CASI
Astronauts; Trusses; Crew Procedures (Inflight); Prelaunch Summaries

20020030893 NASA Johnson Space Center, Houston, TX USA
STS-110 Crew Interviews: Ellen Ochoa
Mar. 12, 2002; In English; Videotape: 27 min. 33 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002049333; JSC-1909D; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

STS-110 Mission Specialist Ellen Ochoa is seen during this preflight interview, where she gives a quick overview of the mission before answering questions about her inspiration to become an astronaut and her career path. Ochoa outlines her role in the mission in general, and specifically her use of the robotic arm during the extravehicular activities (EVAs). She describes the payload (S0 Truss and Mobile Transporter) and the dry run installation of the S0 truss that will take place the day before the EVA for the actual installation. Ochoa discusses the planned EVAs in detail and outlines what supplies will be left for the resident crew of the International Space Station (ISS). She ends with thoughts on the most valuable aspect of the ISS.
CASI
Astronauts; Robot Arms; Prelaunch Summaries

20020030894 NASA Johnson Space Center, Houston, TX USA
STS-110 Crew Interview: Rex Walheim
Mar. 12, 2002; In English; Videotape: 31 min. 44 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002049335; JSC-1909C; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-110 Mission Specialist Rex Walheim is seen during this preflight interview, where he gives a quick overview of the mission before answering questions about his inspiration to become an astronaut and his career path. Walheim outlines his role in the mission in general, and specifically during the docking and extravehicular activities (EVAs). He describes the payload (S0 Truss and Mobile Transporter) and the dry run installation of the S0 truss that will take place the day before the EVA for the actual installation. Walheim discusses the planned EVAs in detail and outlines what supplies will be left for the resident crew of the International Space Station (ISS). He ends with his thoughts on the most valuable aspect of the ISS.
CASI
Astronauts; Trusses; Crew Procedures (Inflight); Prelaunch Summaries

20020030895 NASA Johnson Space Center, Houston, TX USA
STS-110 Crew Interview: Mike Bloomfield
Mar. 12, 2002; In English; Videotape: 32 min. 55 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002049336; JSC-1909A; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-110 Commander Mike Bloomfield is seen during this preflight interview, where he gives a quick overview of the mission before answering questions about his inspiration to become an astronaut and his career path. Bloomfield outlines his role in the mission in general, and specifically during the docking and extravehicular activities (EVAs). He describes the payload (S0 Truss and Mobile Transporter) and the dry run installation of the S0 truss that will take place the day before the EVA for the actual installation. Bloomfield discusses the planned EVAs in detail and outlines what supplies will be left for the resident crew of the International Space Station (ISS). He ends with his thoughts on the most valuable aspect of the ISS.
CASI
Astronauts; Trusses; Crew Procedures (Inflight); Prelaunch Summaries

20020030896 NASA Johnson Space Center, Houston, TX USA
STS-110 Crew Interview: Jerry Ross
Mar. 12, 2002; In English; Videotape: 43 min. 24 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002049338; JSC-1909F; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-110 Mission Specialist Jerry Ross is seen during this preflight interview, where he gives a quick overview of the mission before answering questions about his inspiration to become an astronaut and his career path. Ross outlines his role in the mission in general, and specifically during the docking and extravehicular activities (EVAs). He describes the payload (S0 Truss and Mobile Transporter) and the dry run installation of the S0 truss that will take place the day before the EVA for the actual installation.

Ross discusses the planned EVAs in detail and outlines what supplies will be left for the resident crew of the International Space Station (ISS). He ends with his thoughts on the most valuable aspect of the ISS.
CASI
Astronauts; Trusses; Crew Procedures (Inflight); Prelaunch Summaries

20020030897 NASA Johnson Space Center, Houston, TX USA
STS-110 Crew Interview: Stephen Frick
Mar. 11, 2002; In English; Videotape: 25 min. 9 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002049340; JSC-1909B; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

STS-110 Pilot Stephen Frick is seen during this preflight interview, where he gives a quick overview of the mission before answering questions about his inspiration to become an astronaut and his career path. Frick outlines his role in the mission in general, and specifically during the docking and extravehicular activities (EVAs). He describes the payload (S0 Truss and Mobile Transporter) and the dry run installation of the S0 truss that will take place the day before the EVA for the actual installation. Frick discusses the planned EVAs in detail and outlines what supplies will be left for the resident crew of the International Space Station (ISS). He ends with his thoughts on the most valuable aspect of the ISS.
CASI
Astronauts; Crew Procedures (Inflight); Prelaunch Summaries

20020030898 NASA Johnson Space Center, Houston, TX USA
STS-110 Crew Interviews: Steve Smith
Mar. 12, 2002; In English; Videotape: 42 min. 6 sec. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002049341; JSC-1909G; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

STS-110 Mission Specialist Steve Smith is seen during this preflight interview, where he gives a quick overview of the mission before answering questions about his inspiration to become an astronaut and his career path. Smith outlines his role in the mission in general, and specifically during the docking and extravehicular activities (EVAs). He describes the payload (S0 Truss and Mobile Transporter) and the dry run installation of the S0 truss that will take place the day before the EVA for the actual installation. Smith discusses the planned EVAs in detail and outlines what supplies will be left for the resident crew of the International Space Station (ISS). He ends with his thoughts on the most valuable aspect of the ISS.
CASI
Astronauts; Trusses; Crew Procedures (Inflight); Prelaunch Summaries

20020030913 NASA Johnson Space Center, Houston, TX USA
STS-109 Flight Day 11 Highlights
Mar. 11, 2002; In English; Videotape: 30 min. playing time, in color, with sound
Report No.(s): NONP-NASA-VT-2002049131; BRF-1432K; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On the 11th day of the STS-109 mission, Commander Scott Altman, Pilot Duane Carey, Payload Commander John Grunsfeld, and Mission Specialists Nancy Currie, James Newman, Richard Linnehan, and Michael Massimino are seen answering questions from students in an on-orbit interview. Various shots of the Earth are shown as Columbia orbits over the north of the Australian coast, the west coast of Mexico, Madagascar and the southern Indian Ocean, and the Atlantic coast of Africa.
CASI
Spacecrews; Crew Procedures (Inflight); International Space Station

20020032738 NASA Johnson Space Center, Houston, TX USA
Shuttle-Mir: The USA and Russia Share History's Highest Stage
Morgan, Clay, NASA Johnson Space Center, USA; September 2001; In English; CD-ROM contains full text documents, photos and videos in a variety of formats; See also NASA/SP-2001-4225 which is an illustrated history book companion; Compatible with MAC and Windows Platforms
Report No.(s): NASA/SP-2001-4603; NAS 1.21:4603; NONP-NASA-CD-2002035023; No Copyright; Avail: CASI; C01, CD-ROM

This CD-ROM is a companion to an illustrated history book with the same title. This multi-media, searchable CD includes the full text and images in the book, as well as additional material. Interviews, photographs, and biographies of the U.S. Astronauts,

cosmonauts, and team members for the Shuttle-Mir Program are available. STS Mission Summaries for each mission involved can be viewed, including launch and landing details, crew lists, and mission highlights. Photographs and videos from each mission are included, as well as diagrams of different spacecraft, and computer-generated animations of the Mir deorbit, collision, and flyaround. Additional documents include mission status reports, published documents, news releases, personal letters, and oral histories. The experiments carried out on Mir are described, highlighting combustion and fluid physics research, life in microgravity, and research of the development of the solar system. The focus on improving space technology and planning for the International Space Station is explained. The main features of the book itself include: (1) Training and Operations; (2) Long Duration Psychology; (3) Bilingual Blues; and (4) Earth Observations.
CASI
Mir Space Station; Spaceborne Experiments; Long Duration Space Flight; Spacecrews; Earth Observations (From Space); Space Missions

20020032739 Georgia Inst. of Tech., School of Aerospace Engineering, Atlanta, GA USA
Improvements in Thermal Protection Sizing Capabilities for TCAT: Conceptual Design for Advanced Space Transportation Systems ***Final Report, 16 Dec. 1998 - 15 Dec. 2001***
Olds, John R., Georgia Inst. of Tech., USA; Izon, Stephen James, Georgia Inst. of Tech., USA; February 2002; 92p; In English
Contract(s)/Grant(s): NAG8-1597
Report No.(s): E-16-P51; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Thermal Calculation Analysis Tool (TCAT), originally developed for the Space Systems Design Lab at the Georgia Institute of Technology, is a conceptual design tool capable of integrating aeroheating analysis into conceptual reusable launch vehicle design. It provides Thermal Protection System (TPS) unit thicknesses and acreage percentages based on the geometry of the vehicle and a reference trajectory to be used in calculation of the total cost and weight of the vehicle design. TCAT has proven to be reasonably accurate at calculating the TPS unit weights for in-flight trajectories; however, it does not have the capability of sizing TPS materials above cryogenic fuel tanks for ground hold operations. During ground hold operations, the vehicle is held for a brief period (generally about two hours) during which heat transfer from the TPS materials to the cryogenic fuel occurs. If too much heat is extracted from the TPS material, the surface temperature may fall below the freezing point of water, thereby freezing any condensation that may be present at the surface of the TPS. Condensation or ice on the surface of the vehicle is potentially hazardous to the mission and can also damage the TPS. It is questionable whether or not the TPS thicknesses provided by the aeroheating analysis would be sufficiently thick to insulate the surface of the TPS from the heat transfer to the fuel. Therefore, a design tool has been developed that is capable of sizing TPS materials at these cryogenic fuel tank locations to augment TCAT's TPS sizing capabilities.
Derived from text
Aerodynamic Heat Transfer; Surface Temperature; Systems Analysis; Systems Engineering; Thermal Protection; Computerized Simulation

17
SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes space systems telemetry; space communications networks; astronavigation and guidance; and spacecraft radio blackout. For related information, see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

20020033033 Mudgway (Douglas J.), CA USA
Uplink-Downlink: A History of the Deep Space Network, 1957-1997
Mudgway, Douglas J., Mudgway (Douglas J.), USA; 2001; 736p; In English
Report No.(s): NASA/SP-2001-4227; NAS 1.21:4227; LC-00-058220; ISBN 0-16-066599-X; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

In these pages, the informed reader will discover a simple description of what the Deep Space Network (DSN) is about, and how it works an aspect of NASA's spectacular planetary program that seldom found its way into the popular media coverage of those major events. Future historical researchers will find a complete record of the origin and birth of the DSN, its subsequent development and expansion over the ensuing four decades, and a description of the way in which the DSN was used to fulfill the purpose for which it was created. At the same time, the specialist reader is provided with an abundant source of technical references that address every aspect of the advanced telecommunications technology on which the success of the DSN depended. And finally,

archivists, educators, outreach managers, and article writers will have ready recourse to the inner workings of the DSN and how they related to the more publicly visible events of the planetary space program.
Derived from text
Deep Space Network; Histories; NASA Space Programs; Space Exploration; Space Missions

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.

20020028886 National Center for Microgravity Research on Fluids and Combusiton, Dept. of Mechanical and Aerospace Engineering, Cleveland, OH USA
Spacecraft Fire Safety and Microgravity Combustion Research
Tien, James S., National Center for Microgravity Research on Fluids and Combusiton, USA; [2001]; 5p; In English; Joint Combustion Institute/Aerospace Society Meeting, 17 Mar. 2001, Taiwan, Province of China; Sponsored by Case Western Reserve Univ., USA
Contract(s)/Grant(s): NCC3-633; RTOP 101-32-OB; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Fire safety is an important concern in our daily lives and it plays a special role in the human presence in space. In a spacecraft, the outside environment is hostile and the opportunity to escape is small. Rescue missions are difficult and time consuming. As a result, we should avoid the occurrence of fires in spacecraft as much as possible. If a fire occurs, we need to keep it small and under control. This implies that the materials used on board the spacecraft should be screened carefully, all the machines and devices need to be operated without accident, and fire detectors have to function properly. Once a fire is detected, it can be extinguished quickly and the cabin can be cleaned up to restore operation and sustain life.
Author
Aerospace Safety; Fire Prevention; Fires; Spacecraft Environments; Spaceborne Experiments

20020029887 FDC/NYMA, Inc., Hampton, VA USA
Characterization of Subsystems for a WB-003 Single Stage Shuttle
MacConochie, Ian O., FDC/NYMA, Inc., USA; February 2002; 94p; In English
Contract(s)/Grant(s): NAS1-96013; RTOP 242-33-01-50
Report No.(s): NASA/CR-2002-211249; NAS 1.26:211249; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Subsystems for an all oxygen-hydrogen-single-stage shuttle are characterized for a vehicle designated WB-003. Features of the vehicle include all-electric actuation, fiber optics for information circuitry, fuel cells for power generation, and extensive use of composites for structure. The vehicle is sized for the delivery of a 25,000 lb. payload to a space station orbit without crew. When crew are being delivered, they are carried in a module in the payload bay with escape and manual override capabilities. The underlying reason for undertaking this task is to provide a framework for the study of the operations costs of the newer shuttles.
Author
Payload Stations; Oxygen; Hydrogen; Fiber Optics

20020030290 NASA Glenn Research Center, Cleveland, OH USA
Network Configuration Analysis for Formation Flying Satellites
Knoblock, Eric J., Cleveland State Univ., USA; Wallett, Thomas M., NASA Glenn Research Center, USA; Konangi, Vijay K., Cleveland State Univ., USA; Bhasin, Kul B., NASA Glenn Research Center, USA; [2001]; 10p; In English; 2001 IEEE Aerospace Conference, 10-17 Mar. 2001, Big Sky, MT, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): NCC3-595; RTOP 755-1B-00; ISBN 0-7803-6599-2; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The performance of two networks to support autonomous multi-spacecraft formation flying systems is presented. Both systems are comprised of a ten-satellite formation, with one of the satellites designated as the central or 'mother ship.' All data is routed through the mother ship to the terrestrial network. The first system uses a TCP/EP over ATM protocol architecture within the formation, and the second system uses the IEEE 802.11 protocol architecture within the formation. The simulations consist of file transfers using either the File Transfer Protocol (FTP) or the Simple Automatic File Exchange (SAFE) Protocol. The results

compare the IP queuing delay, IP queue size and IP processing delay at the mother ship as well as end-to-end delay for both systems. In all cases, using IEEE 802.11 within the formation yields less delay. Also, the throughput exhibited by SAFE is better than FTP.
Author
Formation Flying; Network Analysis; Protocol (Computers); Satellite Constellations; Data Transfer (Computers)

20020032309 NASA Ames Research Center, Moffett Field, CA USA
Flight Performance of an Advanced Thermal Protection Material: Toughened Uni-Piece Fibrous Insulation
Leiser, Daniel B., NASA Ames Research Center, USA; Gordon, Michael P., Rockwell International Corp., USA; [1995]; 1p; In English; 47th Pacific Coast Regional Meeting of the American Ceramic Society, 1-3 Nov. 1995, Seattle, WA, USA; Sponsored by American Ceramic Society, USA
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

The flight performance of a new class of low density, high temperature, thermal protection materials (TPM), is described and compared to ”standard” Space Shuttle TPM. This new functionally gradient material designated as Toughened Uni-Piece Fibrous Insulation (TUFI), was bonded on a removable panel attached to the base heatshield of Orbiter 105, Endeavor.
Author
Thermal Protection; Insulation; Flight Characteristics; Fibers

20020033017 NASA Ames Research Center, Moffett Field, CA USA
Feasibility Study of Laboratory Simulation of Single-Stage-to-Orbit Vehicle Base Heating
Park, Chung Sik, NASA Ames Research Center, USA; Sharma, Surendra, NASA Ames Research Center, USA; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

The feasibility of simulating in a laboratory the heating environment of the base region of the proposed reusable single-stage-to-orbit vehicle during its ascent is examined. The propellant is assumed to consist of hydrocarbon (RP1), liquid hydrogen (LH2), and liquid oxygen (LO2), which produces CO and H2 as the main combustible components of the exhaust effluent. Since afterburning in the recirculating region can dictate the temperature of the base flowfield and ensuing heating phenomena, laboratory simulation focuses on the thermochemistry of the afterburning. by extrapolating the Saturn V flight data, the Damkohler number, in the base region with afterburning for SSTO vehicle, is estimated to be between 30 and 140. It is shown that a flow with a Damkohler number of 1.8 to 25 can be produced in an impulse ground test facility. Even with such a reduced Damkohler number, the experiment can adequately reproduce the main features of the flight environment.
Author
Feasibility; Single Stage to Orbit Vehicles; Computerized Simulation; Flow Distribution; Base Heating

20020033030 NASA Marshall Space Flight Center, Huntsville, AL USA
Spacecraft Charging Calculations: NASCAP-2K and SEE Spacecraft Charging Handbook
Davis, V. A., Science Applications International Corp., USA; Neergaard, L. F., Sverdrup Technology, Inc., USA; Mandell, M. J., Science Applications International Corp., USA; Katz, I., Jet Propulsion Lab., California Inst. of Tech., USA; Gardner, B. M., Science Applications International Corp., USA; Hilton, J. M., Science Applications International Corp., USA; Minor, J., NASA Marshall Space Flight Center, USA; [2002]; 14p; In English; Original contains color illustrations
Report No.(s): AIAA Paper 2002-0626; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

For fifteen years NASA and the Air Force Charging Analyzer Program for Geosynchronous Orbits (NASCAP/GEO) has been the workhorse of spacecraft charging calculations. Two new tools, the Space Environment and Effects (SEE) Spacecraft Charging Handbook (recently released), and Nascap-2K (under development), use improved numeric techniques and modern user interfaces to tackle the same problem. The SEE Spacecraft Charging Handbook provides first-order, lower-resolution solutions while Nascap-2K provides higher resolution results appropriate for detailed analysis. This paper illustrates how the improvements in the numeric techniques affect the results.
Author
Computerized Simulation; Handbooks; Spacecraft Charging; Computer Programs

20
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.

20020028403 NASA Glenn Research Center, Cleveland, OH USA
The Floating Potential Probe (FPP) for ISS: Operations and Initial Results
Ferguson, Dale C., NASA Glenn Research Center, USA; Hillard, G. Barry, NASA Glenn Research Center, USA; Morton, Thomas L., Ohio Aerospace Inst., USA; [2001]; 4p; In English; 7th Spacecraft Charging Technology Conference, 23-27 Apr. 2001, Noordwijk, Netherlands; Sponsored by European Space Agency, Unknown
Contract(s)/Grant(s): RTOP 755-1A-05; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In this paper we report early results from the Floating Potential Probe (FPP) recently installed on the International Space Station (ISS). The data show that FPP properly measures the electrical potential of ISS structure with respect to the plasma it is flying through. FPP Langmuir probe data seem to give accurate measurements of the ambient plasma density, and are generally consistent with the IRI-90 model. FPP data are used to judge the performance of the ISS Plasma Contacting Units (PCUs), and to evaluate the extent of ISS charging in the absence of the PCUs.
Author
Electrostatic Probes; International Space Station; Space Plasmas

20020029297 JCM Consulting, Inc., Huntsville, AL USA
Rocket Propellants Engine Design/Operations/Validation ***Final Report***
Monk, Jan C., JCM Consulting, Inc., USA; Feb. 01, 2002; 6p; In English; CD-ROM contains full text document if WordPerfect format, Appendix A in Microsoft PowerPoint and Appendices in Microsoft Excel
Contract(s)/Grant(s): NASA Order H-34418-D
Report No.(s): NONP-NASA-CD-2002032679; No Copyright; Avail: CASI; C01, CD-ROM; A02, Hardcopy; A01, Microfiche

Lockheed Martin Astronautics Operations (LMA) was competitively awarded a contract May 21, 2001 for next generation launch system architecture definition and technology maturation. The Second Generation Launch Vehicle Program objectives include reducing the technical and programmatic risk of proceeding to full scale development of the system by establishing requirements for the next generation launch system and maturing critical technologies needed by the system. LMA will conduct analyses and trades to optimize the architecture ETO elements including configuration, conceptual designs, and preliminary operations definition. to fully understand the engine and propellant trades were conducted by LMA to yield the optimized architecture system from the operability, reliability, safety, and cost perspectives. A government/industry team addressed the required trade studies, the parameters and weighting factors, and the most critical trades were addressed. This report summarizes the participation of JCM Consulting, Inc. in the propellant trade study.
Author
Engine Design; Launch Vehicles; Rocket Propellants

20020030027 ATK-Thiokol Propulsion, Gas Dynamics Section, Brigham City, UT USA
Modeling the Gas Dynamics Environment in a Subscale Solid Rocket Test Motor
Eaton, Andrew M., ATK-Thiokol Propulsion, USA; Ewing, Mark E., ATK-Thiokol Propulsion, USA; Bailey, Kirk M., ATK-Thiokol Propulsion, USA; [2001]; 40p; In English; 37th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 8-11 Jul. 2001, Salt Lake City, UT, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Contract(s)/Grant(s): NAS8-38100
Report No.(s): AIAA Paper 2001-3584; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Subscale test motors are often used for the evaluation of solid rocket motor component materials such as internal insulation. These motors are useful for characterizing insulation performance behavior, screening insulation material candidates and obtaining material thermal and ablative property design data. One of the primary challenges associated with using subscale motors however, is the uncertainty involved when extrapolating the results to full-scale motor conditions. These uncertainties are related to differences in such phenomena as turbulent flow behavior and boundary layer development, propellant particle interactions with the wall, insulation off-gas mixing and thermochemical reactions with the bulk flow, radiation levels, material response to the local environment, and other anomalous flow conditions. In addition to the need for better understanding of physical mechanisms, there is also a need to better understand how to best simulate these phenomena using numerical modeling approaches

such as computational fluid dynamics (CFD). to better understand and model interactions between major phenomena in a subscale test motor, a numerical study of the internal flow environment of a representative motor was performed. Simulation of the environment included not only gas dynamics, but two-phase flow modeling of entrained alumina particles like those found in an aluminized propellant, and offgassing from wall surfaces similar to an ablating insulation material. This work represents a starting point for establishing the internal environment of a subscale test motor using comprehensive modeling techniques, and lays the groundwork for improving the understanding of the applicability of subscale test data to full-scale motors. It was found that grid resolution, and inclusion of phenomena in addition to gas dynamics, such as two-phase and multi-component gas composition are all important factors that can effect the overall flow field predictions.
Author
Gas Dynamics; Solid Propellant Rocket Engines; Mathematical Models; Flow Distribution; Computational Fluid Dynamics

20020030127 Auburn Univ., Space Research Inst., AL USA
Power Without Wires (POWOW) ***Final Report***
Brandhorst, Henry W., Jr., Auburn Univ., USA; Feb. 20, 2002; 15p; In English
Contract(s)/Grant(s): NAG8-1617; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Electric propulsion has emerged as a cost-effective solution to a wide range of satellite applications. Deep Space 1 successfully demonstrated electric propulsion as the primary propulsion source for a satellite. The POWOW concept is a solar-electric propelled spacecraft capable of significant cargo and short trip times for traveling to Mars. There it would enter areosynchronous orbit (Mars GEO equivalent) and beam power to surface installations via lasers. The concept has been developed with industrial partner expertise in high efficiency solar cells, advanced concentrator modules, innovative arrays, and high power electric propulsion systems. The present baseline spacecraft design providing 898 kW using technologies expected to be available in 2003 will be described. Areal power densities approaching 350 W/sq m at 80 C operating temperatures and wing level specific powers of over 350 W/kg are projected. Details of trip times and payloads to Mars are presented. Electric propulsion options include Hall, MPD, and ion thrusters of various power levels and trade studies have been conducted to define the most advantageous options. Because the design is modular, learning curve methodology has been applied to determine expected cost reductions and is included.
Author
Electric Propulsion; Propulsion System Configurations; Mars Missions; Laser Power Beaming; Solar Arrays

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.

20020027461 NASA Ames Research Center, Moffett Field, CA USA
Theoretical Infrared Spectra for Polycyclic Aromatic Hydrocarbon Neutrals, Cations and Anions
Langhoff, Stephen R., NASA Ames Research Center, USA; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

Calculations are carried out using density functional theory (DFT) to determine the harmonic frequencies and intensities of the neutrals and cations of thirteen polycyclic aromatic hydrocarbons (PAHs) up to the size of ovalene. Calculations are also carried out for a few PAH anions. The DFT harmonic frequencies, when uniformly scaled by the factor of 0.958 to account primarily for anharmonicity, agree with the matrix isolation fundamentals to within an average error of about 10 per centimeter. Electron correlation is found to significantly reduce the intensities of many of the cation harmonics, bringing them into much better agreement with the available experimental data. While the theoretical infrared spectra agree well with the experimental data for the neutral systems and for many of the cations, there are notable discrepancies with the experimental matrix isolation data for some PAH cations that are difficult to explain in terms of limitations in the calculations. In agreement with previous theoretical work, the present calculations show that the relative intensities for the astronomical unidentified infrared (UIR) bands agree reasonably well with those for a distribution of polycyclic aromatic hydrocarbon (PAH) cations, but not with a distribution of PAH neutrals. We also observe that the infrared spectra of highly symmetrical cations such as coronene agree much better with astronomical observations than do those of, for example, the polyacenes such as tetracene and pentacene. The total integrated intensities for the neutral species are found to increase linearly with size, while the total integrated intensities are much larger for

the cations and scale more nearly quadratically with size. We conclude that emission from moderate-sized highly symmetric PAH cations such as coronene and larger could account for the UIR bands.
Author
Anions; Cations; Infrared Spectra; Polycyclic Aromatic Hydrocarbons; Harmonics; Neutral Atoms

20020027698 European Materials Research Society, Strasbourg France
E-MRS Conference, Symposium B: Protective Coatings and Thin Films, Strasbourg, France 1-4 Jun 1999
Sartwell, B. D.; Matthews, A.; Mar. 2000; 451p; In English; For sales information of individual items, see AD- thru AD- For individual articles, see ADP011424 thru ADP011499
Report No.(s): AD-A398542; ISSN 0257-8972; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche
This symposium belongs to a series of E-MRS symposia started in 1993. The title 'Protective Coatings and Thin Films' adopted for the 1999 symposium will be maintained for the foreseeable future to ensure a desirable continuity required for members of the European scientific community/ For the 1999 symposium, emphasis was placed on fundamental aspects of vapor deposition technology, in particular on relationships between physical and/or chemical phenomena involved in vapor deposition processes and progress in surface treatments, energy bean processing, ion implantation processing, ion beam and plasma processing, wear-resistant coatings, multilayer coatings, nitride coatings, hard and protective coatings, physical and chemical vapor-deposited coatings, polymer coating and oxide coatings.
DTIC
Thin Films; Vapor Deposition; Protective Coatings; Surface Treatment

20020028004 National Renewable Energy Lab., Golden, CO USA
Functionalized Vegetable Oils for Utilization as Polymer Building Blocks: Office of Industrial Technologies (OIT) Agriculture Project Fact Sheet
Carde, T.; Sep. 12, 2001; 2p; In English
Report No.(s): DE2001-789068; DOE/GO-102001-1459; NREL/FS-810-30905; No Copyright; Avail: Department of Energy Information Bridge
Vegetable oils such as soybean oil will be converted to novel polymers using hydroformylation and other catalytic processes. These polymers can be used in the construction, automotive, packaging, and electronic sectors.
NTIS
Polymer Chemistry; Soybeans; Carbonyl Compounds

20020028005 National Renewable Energy Lab., Golden, CO USA
1,3-Propanediol Make Fermentation-Derived Malonic Acid: Office of Industrial Technologies (OIT) Agriculture Project Fact Sheet
Carde, T.; Sep. 12, 2001; 2p; In English
Report No.(s): DE2001-789067; DOE/GO-102001-1458; NREL/FS-810-30904; No Copyright; Avail: Department of Energy Information Bridge
1,3-Propanediol is one of two ingredients used in producing polytrimethylene terephthalate (PTT), a polymer which can be used in polyester and nylon applications. Researchers are developing a process to ferment biomass feedstock to malonic acid using filamentous fungi and then catalytically convert malonic acid to 1,3-propanediol.
NTIS
Biomass; Polyesters

20020029289 Oak Ridge Y-12 Plant, TN USA
Modeling of the Microchemistry for Diffusion of Selected Impurities in Uranium
Kirkpatrick, J. R.; Bullock, J. S.; Sep. 01, 2001; 27p; In English
Report No.(s): DE2001-789526; Y/DZ-2342; No Copyright; Avail: Department of Energy Information Bridge
Unalloyed metallic uranium used in some work done at Y-12 contains small quantities of impurities, the three most significant of which are carbon, ion, and silicon. During metallurgical processing, as the metallic matrix solution becomes supersaturated in each of the impurities whose concentration exceeds the solubility limit. Many impurity atoms form compounds with uranium that precipitate out of the solution, thus creating and growing inclusions. The objective of the present work is to study the distribution of impurity atoms about some of the inclusions, with a view toward examining the effect of the interaction between inclusions on the impurity atom distribution. The method used is time-dependent mass diffusion from the supersaturated solution to the surfaces of the inclusions. Micrographs of metal samples suggest that the inclusions form in successive stages. After each

inclusion forms, it begins to draw impurity atoms from its immediate vicinity, thus altering the amounts and distributions of impurity atoms available for formation and growth of later inclusions. In the present work, a one-dimensional spherical approximation was used to simulate inclusions and their regions of influence. A first set of calculations was run to simulate the distribution of impurity atoms about the largest inclusions. Then, a second set of calculations was run to see how the loss of impurity atoms to the largest inclusions might affect the distribution of impurity atoms around the next stage of inclusions. Plots are shown for the estimated distributions of impurity atoms in the region of influence about the inclusions for the three impurities studied. The authors believe that these distributions are qualitatively correct. However, there is enough uncertainty about precisely when inclusions nucleate and begin to grow that one should not put too much reliance on the quantitative results. This work does provide a framework and an advance toward a comprehensive model of uranium metal microchemical distributions.
NTIS
Uranium; Chemical Analysis; Diffusion; Impurities; Carbon

20020029842 Los Alamos National Lab., NM USA
Chemical imaging applications of materials characterization: Corrosion, alloys, and MOX feed surrogate
Schoonover, J. R.; Havrilla, G.; Treado, P.; Nov. 01, 1999; 7p; In English
Report No.(s): DE2001-785166; LA-UR-99-2918; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Chemical imaging using micro X-ray fluorescence, micro Raman and micro infrared spectroscopies is a powerful approach for materials characterization. The spatial resolution of this integrated data format ranges from sub-micrometer to around 50 micrometers. This approach is applied to corrosion of drum filters in waste drums, tantalum metal for mixed oxide fuel feed production. A preliminary effort in quantitative imaging is also reported for a uranium alloy.
NTIS
Imaging Techniques; Tantalum Oxides; Corrosion; X Ray Fluorescence

20020029856 Oak Ridge Y-12 Plant, TN USA
Analysis of Dyes Extracted from Millimeter-Size Nylon Fibers by Micellar Electrokinetic Chromatography
Lewis, L. A.; Jul. 30, 2001; 4p; In English
Report No.(s): DE2001-789258; Y/DK-1185; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Developing a means of analyzing extracted dye constituents from millimeter-size nylon fiber samples was the objective of this research initiative. Aside from ascertaining fiber type, color evaluation and source comparison of trace-fiber evidence plays a critical role in forensic-fiber examinations. Literally thousands of dyes exist to-date, including both natural and synthetic compounds. Typically a three-color-dye combination is employed to affect a given color fiber material. The result of this practice leads to a significant number of potential dye combinations capable of producing a similar color and shade. Since a typical forensic fiber sample is 2 mm or less in length, an ideal forensic dye analysis would qualitatively and quantitatively identify the extracted dye constituents from a sample size of 1 mm or smaller. The goal of this research was to develop an analytical method for comparing individual dye constituents from trace-fiber evidence with dyes extracted from a suspected source, while preserving as much of the original evidence as possible.
NTIS
Dyes; Chemical Analysis; Nylon (Trademark); Electrokinetics; Law (Jurisprudence)

20020030232 Argonne National Lab., IL USA
ESR transmission experiments on beta'-(ET)2SF5CF2SO3 and ET2SF5NNO2, investigations of spin-peierls systems
Rutel, B.; Brooks, J.; Ward, B. H.; VanDerveer, D.; Sitzmann, M. E.; Dec. 04, 2001; 7p; In English
Report No.(s): DE2001-789735; ANL/MSD/CP-106305; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
An anisotropic temperature dependent ESR investigation of the organic systems B'-(ET)2SF5CF2SO3 and (ET)2SFF5NNO2 has led to the indication of a spin-Peierls transition at TSP=33, and 5K, respectively. We present the details of our investigation and place our data in the context of the general spin-Peierls theory. We also show the dc susceptibility SQUID measurements revealing novel behavior in the second material. Note that to access the high field regime, large fields and high frequencies are needed.
NTIS
Nitrogen Dioxide; Magnetic Resonance; High Frequencies; Anisotropy; Electron Paramagnetic Resonance

20020032319 Army Construction Engineering Research Lab., Champaign, IL USA

Pilot-Scale Reactor for Electrochemical Reduction of Nitroaromatics in Water. Simulated Wastewater Testing ***Final Report***

Doppalapudi, Rajesh; Palaniswamy, Dinesh; Sorial, George; Maloney, Stephen W.; Nov. 2001; 44p; In English

Report No.(s): AD-A398742; ERDC/CERL-TR-01-69; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The large-scale manufacture and use of nitroaromatic compounds such as TNT, DNT, and RDX has led to significant production of munitions wastewater. Wastewater containing these compounds is commonly referred to as pinkwater. The USA ceased production of TNT in the mid-l98Os, but TNT-contaminated wastewater generation still exists as a result of demilitarization. Both TNT and DNT are listed as priority pollutants by the U.S. Environmental Protection Agency because of their toxicology hazards. This study used an existing pilot-scale reactor, which was modified to account for mass transfer limitations observed in a previous study, to evaluate the performance of the modified reactor for electrochemical reduction of simulated munitions wastewater and pinkwater. Kinetic rate determination of RDX, HMX (a military explosive), and Tritanol (munitions wastewater with suspected aluminum and iron metal ions) reduction was studied at the bench-scale in an electrochemical batch reactor. These experiments yielded low rate constants. Continuous flow experiments conducted on the modified reactor showed very low DNT reduction. End product studies for batch simulation experiments conducted on the pilot-scale reactor showed a mass balance of 60 to 90 percent, and most of the intermediates were observed in the solid phase. Based on these results, continuous flow experiments were conducted on the pilot-scale reactor. A DNT reduction of about 80 percent could be attained for these experiments. End product studies conducted on the continuous flow experiments showed a mass balance of about 100 percent, with 80 percent of the intermediates observed in the solid phase.

DTIC

Electrochemistry; Waste Treatment; Explosives; Nitrous Acid; Chemical Engineering

24
COMPOSITE MATERIALS

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

20020027242 Institute of Materials Research and Engineering, Singapore

Fracture and Toughening of Composites of Polymers and Nanoscale Inorganic and Organic Fillers ***Final Report, 11 Jan. 2000-24 Nov. 2001***

Yee, Albert F.; Chung, Neal T.; Oct. 24, 2001; 41p; In English

Contract(s)/Grant(s): F6258200M9202

Report No.(s): AD-A398475; AOARD-004016; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objectives of the project were to investigate the mechanical properties and particularly the fracture mechanisms of a number of nanocomposites, and to discover possible approaches to their toughening. The nanocomposites investigated included PA-6/clay (materials supplied by the AFRL) and silsesquioxane-based hybrid materials (supplied by Prof. Rick Laine of the University of Michigan). The embrittlement of PA-6 nano-clay composites was mainly due to microcracking, followed by global fracture. The toughening-by-bridging approach proved to be somewhat effective. PVDF shows no evidence of plastic deformation, but exhibited good adhesion. Silsesquioxane/epoxy based on octa-cyclohexenyl silsesquioxane epoxide cubes and diaminodiphenyl methane was brittle, but some plastic deformation was observed. Toughening through additions of core-shell rubber particle (up to 4 wt.%) was not very effective. Further study may involve high concentrations of CSR.

DTIC

Fracturing; Nanocomposites; Fracture Mechanics

20020027255 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA

Strength and Durability of Glass Fiber Composites Treated With Multicomponent Sizing Formulations ***Final Report, 18 Dec. 2000-3 Feb. 2001***

Jensen, Robert E.; McKnight, Steven H.; Quesenberry, Matthew J.; Jan. 2002; 38p; In English

Report No.(s): AD-A398589; ARL-TR-2655; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Commercial fiber-sizing packages have been developed to enhance the strength and moisture resistance of composite materials, which typically decreases ballistic performance. Potential sizing packages developed for Future Combat Systems will need to enhance ballistic response while maintaining the levels of durability currently benchmarked by existing commercial systems. For this research, pultruded vinyl ester/E-glass composites were manufactured in which the silane, film former resin, and surfactant reactivity were varied to mimic the complete spectrum of commercially available fiber-sizing packages. The

interlaminar shear strengths of dry and moisture-saturated composites were then measured via 3-point bend testing. These strength and durability results will be used as the standards of comparison for future development of ballistic sizing packages for composite armor applications.
DTIC
Glass Fibers; Durability; E Glass; Fiber Composites; Reinforcement (Structures); Mechanical Properties

20020027712 Syracuse Univ., Dept. of Mechanical, Aerospace and Manufacturing Engineering, NY USA
Predictive Methodology for Delamination Growth in Laminated Composites, Part 2, Analysis, Applications, and Accuracy Assessment ***Final Report***
Davidson, B. D.; Oct. 2001; 136p; In English
Contract(s)/Grant(s): FAA-94-G-022
Report No.(s): PB2002-101929; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
A nonclassical, energy release rate-based approach to predict delamination growth is described that overcomes the limitations of current, state-of-the-art methodologies. First, two- and three-dimensional crack-tip elements are introduced. When a classical singular field-based mode decomposition procedure is used, the crack-tip elements are shown to predict the same values of energy release rate and mode mixity as two- and three-dimensional continuum finite element analyses for a wide variety of geometries, materials, lay-ups and loadings, including stiffened-skin construction typical to that used in aircraft construction. However, the crack tip element (CTE) analyses are considerably simpler and require orders of magnitude less development and execution time. Next, it is demonstrated that the CTE analyses may also be used to decompose the total energy release rate into nonclassical mode 1, 2, and 3 components. This nonsingular field (NSF) decomposition may be used, along with toughness versus mode mix data obtained from undirectional laminates with midplane delaminations, to predict delamination growth with considerably better accuracy than the classical, state-of-the-art approach. This is due to the fact that the near-tip damage zone is sufficiently large in polymeric matrix composites to invalidate the classical assumptions, whereas the NSF mode decomposition is constructed in a manner that is insensitive to the details of this local damage state.
NTIS
Crack Tips; Damage; Decomposition; Delaminating; Laminates

20020028156 Washington Univ., Dept. of Mechanical Engineering, Seattle, WA USA
Thermomechanical Behavior of Functionally Graded Materials (FGM) ***Final Report, 1 Jun. 1997-31 Dec. 2000***
Hudnut, Steven; Taya, Minoru; Nov. 15, 2001; 25p; In English
Contract(s)/Grant(s): F49620-97-1-0420
Report No.(s): AD-A398654; AFRL-SR-BL-TR-02-0012; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This final report is to document a summary of Ph.D. Student, Mr. Steven Hudnut, who was supported by this ASSERT Grant, working on design of piezoactuators with functionally graded microstructure (FGM). Mr. Hudnut has achieved both analytical modeling of several FGM piezo-laminate actuators with the aim of maximizing the bending displacement while minimizing the internal stress, thus enhancing its fatigue life. Mr. Hudnut designed a new laser displacement measurement apparatus by which the bending performance of bimorph and bimorph FGM piezo-actuators are characterized. He also contributed to the construction of lamination model for piezolaminated composites, as well as optimization of the FGM bimorph actuator mode of continuous piezofibers.
DTIC
Displacement Measurement; Microstructure; Piezoelectric Actuators; Thermodynamics; Piezoelectricity

20020028166 Delaware Univ., Dept. of Mechanical Engineering, Newark, DE USA
Advanced Composite Materials for the New World Vistas ***Final Report, 15 Nov. 1997-30 Sep. 2001***
Vinson, Jack R.; Dec. 19, 2001; 49p; In English
Contract(s)/Grant(s): F49620-98-1-0384
Report No.(s): AD-A398644; AFRL-SR-BL-TR-02-0013; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The study of mechanics of sandwich structures and a development of new and innovative structural concepts have been conducted in the course of the effort. In particular, our research was concerned with a development of Sanders-type theory of cylindrical sandwich shells with different facing operating in hostile environment. This theory was further extended to elliptical shells. The effects of internal ribs located on the inner surface of the facings and the woven facing construction on the response of sandwich structures was studied. In particular, rib-reinforced facings were probably first suggested in the course of the present effort. These new structural concepts are important since woven facings can reduce the tendency to delamination, while rib-reinforced facing results in enhanced local strength and stiffness. Also, the effect of damage in the form of matrix cracks in

the facings on the response and performance of sandwich panels was investigated. The similarity conditions for sandwich shells were formulated, jointly with Drs. Simitses, Song, and Frostig. The study of a new concept of sandwich structures with truss-reinforced core (Z-fiber reinforced core) was undertaken. The latter design may prove attractive in applications where significant shear and off-axis loads are applied to the structures. Other subjects that were investigated include the evaluation of the shear correction coefficient for sandwich structures analyzed by the first-order theory. The latest effort was a development of an analytical model capable of predicting damping of sandwich structures.
DTIC
Fiber Composites; Mathematical Models; Ribs (Supports); Sandwich Structures

20020028707 Ohio Aerospace Inst., Cleveland, OH USA
Intermediate Temperature Strength Degradation in SiC/SiC Composites
Morscher, Gregory N., Ohio Aerospace Inst., USA; Cawley, James D., Case Western Reserve Univ., USA; [2001]; 30p; In English
Contract(s)/Grant(s): NCC3-763; RTOP 714-04-30; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Woven silicon carbide fiber-reinforced, silicon carbide matrix composites are leading candidate materials for an advanced jet engine combustor liner application. Although the use temperature in the hot region for this application is expected to exceed 1200 C, a potential life-limiting concern for this composite system exists at intermediate temperatures (800 +/- 200 C), where significant time-dependent strength degradation has been observed under stress-rupture loading. A number of factors control the degree of stress-rupture strength degradation, the major factor being the nature of the interphase separating the fiber and the matrix. BN interphases are superior to carbon interphases due to the slower oxidation kinetics of BN. A model for the intermediate temperature stress-rupture of SiC/BN/SiC composites is presented based on the observed mechanistic process that leads to strength degradation for the simple case of through-thickness matrix cracks. The approach taken has much in common with that used by Curtin and coworkers, for two different composite systems. The predictions of the model are in good agreement with the rupture data for stress-rupture of both precracked and as-produced composites. Also, three approaches that dramatically improve the intermediate temperature stress-rupture properties are described: Si-doped BN, fiber spreading, and 'outside debonding'.
Author
Creep Rupture Strength; Degradation; Fiber Composites; Linings; Silicon Carbides; Combustion Chambers

20020028708 Ohio Aerospace Inst., Cleveland, OH USA
The Velocity and Attenuation of Acoustic Emission Waves in SiC/SiC Composites Loaded in Tension
Morscher, Gregory N., Ohio Aerospace Inst., USA; Gyekenyesi, Andrew L., Ohio Aerospace Inst., USA; [2002]; 22p; In English
Contract(s)/Grant(s): NCC3-763; RTOP 714-04-30; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The behavior of acoustic waves produced by microfracture events and from pencil lead breaks was studied for two different silicon carbide fiber-reinforced silicon carbide matrix composites. The two composite systems both consisted of Hi-Nicalon (trademark) fibers and carbon interfaces but had different matrix compositions that led to considerable differences in damage accumulation and acoustic response. This behavior was primarily due to an order of magnitude difference in the interfacial shear stress for the two composite systems. Load/unload/reload tensile tests were performed and measurements were made over the entire stress range in order to determine the stress-dependence of acoustic activity for increasing damage states. It was found that using the extensional wave velocities from acoustic emission (AE) events produced from pencil lead breaks performed outside of the transducers enabled accurate measurements of the stiffness of the composite. The extensional wave velocities changed as a function of the damage state and the stress where the measurement was taken. Attenuation for AE waveforms from the pencil lead breaks occurred only for the composite possessing the lower interfacial shear stress and only at significantly high stresses. At zero stress after unloading from a peak stress, no attenuation occurred for this composite because of crack closure. For the high interfacial stress composite no attenuation was discernable at peak or zero stress over the entire stress-range of the composite. From these observations, it is believed that attenuation of AE waveforms is dependent on the magnitude of matrix crack opening.
Author
Acoustic Emission; Ceramic Matrix Composites; Microcracks; Acoustic Velocity

20020031242 NASA Glenn Research Center, Cleveland, OH USA
Scale Adhesion, Sulfur Content, and TBC Failure on Single Crystal Superalloys
Smialek, James L., NASA Glenn Research Center, USA; [2002]; 1p; In English; 26th International Conference on Advanced Ceramics and Composites Symposium II: Advanced Ceramic Coatings, 13-18 Jan. 2002, Cocoa Beach, FL, USA
Contract(s)/Grant(s): RTOP 708-87-32-20; No Copyright; Avail: Issuing Activity; Abstract Only

This paper summarizes the main effects of sulfur impurity content on the cyclic oxidation resistance of single crystal superalloys, with emphasis on scale and TBC adhesion. Eleven hundred degrees C cyclic oxidation of PWA 1480 produces scale

spallation leading to a weight loss of more than 30 Mg/sq cm after 500 one-hr cycles for a sulfur content of 6 ppmw. The sulfur content was reduced to levels below 0.1 ppmw by hydrogen annealing, resulting in weight gains of only 0.5 to 1.0 Mg/sq cm after 1000 one-hr cycles. Samples were produced with various sulfur contents by adjusting the annealing temperature, time, and sample thickness (i.e., diffusion product Dt/L(exp 2)). The subsequent cyclic oxidation behavior, mapped over a sulfur content/thickness diagram, shows a transition to adherent behavior at sulfur levels equivalent to 1 monolayer of total segregation. Additional information is contained in the original extended abstract.
Derived from text
Impurities; Single Crystals; Sulfur; Oxidation Resistance; Adhesion

20020031755 Instituto Superior Tecnico, Lisbon Portugal
International Conference on Electromagnetics of Complex Media (8th), Held in Lisbon, Portugal on 27-29 September 2000. Bianisotropics 2000
Barbosa, Afonso M.; Topa, Antonio L.; Sep. 29, 2000; 423p; In English; For individual articles, see ADP011588 thru ADP011680
Report No.(s): AD-A398724; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche
Partial Contents: Complex Media I; Composite Materials: Theory; Composite Materials: Numerical Studies and Experiments; Bianisotropic Media I; Nanostructures and Related Topics; Chiral Materials and Structures: Theory and Experiments; Propagation and Scattering; Wire, Turbid and Chiroferrite; Waves and Fields; Additional Boundary Conditions for Spatially Dispersive Media; The Application of Orthonormal Beams to Characterizing Complex Media; On the Problem of Constitutive Parameters of Composite Materials; Homogenization Formalisms for Nonlinear Particulates Composite Mediums; The Incremental and Differential Maxwell Garnett Formalism for Bianisotropic Composites; Numerical Study of Nonlinear Composites; Numerical Computation of the Effective Quasi-Static Permittivity for Isotropic and Anisotropic Lattices of Complex Shaped Inclusions.
DTIC
Optical Materials; Electromagnetic Wave Transmission; Electromagnetic Radiation

20020032334 State Univ. of New York, Research Foundation, Albany, NY USA
3D Digital Data-Storage Using Two-Photon Process: A Demonstration Task/ Novel Multifunctional Chromophores for Electro-Optic and Other Photonics Applications ***Final Report, 1 Sep. 1997-30 Jun. 2001***
Prasad, Paras N.; Jun. 2001; 8p; In English
Contract(s)/Grant(s): F49620-97-1-0529; Proj-1651
Report No.(s): AD-A398794; AFRL-SR-BL-TR-02-0027; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
New opto-electronic and composite materials with enhanced photonic performance were developed and that applicators in 3D optical data-storage, 3D optical-circuitry, 3D micro-fabrications and photorefractivity were studied. Two-photo based technology was used to do photo-crosslinking at a precise volume location to produce complex 3D optical-circuitry such a waveguide splitters and grating couplers as well as for fabricating MEMS. Another area of our activity has been in preparation of photonic band gap materials for visible and near-IR range. Highly monodispersed silica and polystyrene spheres of varying diameter(100-800nm) were prepared and photonic crystals made from them showed photonic pseudogaps. We have successfully infiltrated the pores with a high refractive index conjugated polymer, PPV and etched out the silica spheres. The resulting inverter-photonic crystal exhibits enhanced reflectance at the band gap. Using a new approach of photosensitization with nanocrystallites of inorganic semiconductors, we have prepared photorefractive composite for operation at l.31 micrometer and this approach can be extended for preparation of photorefractive materials with a tailored spectral response. Our new materials development in collaboration with Wright lab has made it possible to use two-photon approach to write information in different layers with the capacity of terabits/cm(3), which can flow be read by using a simple CW green laser. A three dimensional digital data-storage system based on two-photon process also was demonstrated. We have written layers of digital data in a dye doped polymer media (AF-240 from Air force Polymer branch doped in PMMA) using highly localized two-photon process. We have demonstrated a new data read back system using a 532nm solid state laser and were able to read the data using confocal single photon fluorescence detection.
DTIC
Electro-Optics; Three Dimensional Models; Fabrication; Photonics; Photorefractivity; Nanotechnology; Data Storage

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.

20020027487 NASA Ames Research Center, Moffett Field, CA USA
Using Density Functional Theory (DFT) for the Calculation of Atomization Energies
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; Partridge, Harry, NASA Ames Research Center, USA; [1995]; 1p; In English; Pacific Basin Conference, 17-23 Dec. 1995, Honolulu, HI, USA
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

The calculation of atomization energies using density functional theory (DFT), using the B3LYP hybrid functional, is reported. The sensitivity of the atomization energy to basis set is studied and compared with the coupled cluster singles and doubles approach with a perturbational estimate of the triples (CCSD(T)). Merging the B3LYP results with the G2(MP2) approach is also considered. It is found that replacing the geometry optimization and calculation of the zero-point energy by the analogous quantities computed using the B3LYP approach reduces the maximum error in the G2(MP2) approach. In addition to the 55 G2 atomization energies, some results for transition metal containing systems will also be presented.
Author
Atomizing; Perturbation

20020027535 University of Southern California, Dept. of Aerospace and Mechanical Engineering, Los Angeles, CA USA
Dynamics and Structure of Dusty Reacting Flows: Inert Particles in Strained, Laminar, Premixed Flames
Egolfopoulos, Fokion N., University of Southern California, USA; Campbell, Charles S., University of Southern California, USA; Combustion and Flame; 1999; ISSN 0010-2180; Volume 117, pp. 206-226; In English
Contract(s)/Grant(s): NAG3-1877; RTOP 101-12-00; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A detailed numerical study was conducted on the dynamics and thermal response of inert spherical particles in strained, laminar, premixed hydrogen/air flames. The modeling included the solution of the steady conservation equations for both the gas and particle phases along and around the stagnation streamline of an opposed-jet configuration, and the use of detailed descriptions of chemical kinetics and molecular transport. For the gas phase, the equations of mass, momentum, energy, and species are considered, while for the particle phase, the model is based on conservation equations of the particle momentum balance in the axial and radial direction, the particle number density, and the particle thermal energy equation. The particle momentum equation includes the forces as induced by drag, thermophoresis, and gravity. The particle thermal energy equation includes the convective/conductive heat exchange between the two phases, as well as radiation emission and absorption by the particle. A one-point continuation method is also included in the code that allows for the description of turning points, typical of ignition and extinction behavior. As expected, results showed that the particle velocity can be substantially different than the gas phase velocity, especially in the presence of large temperature gradients and large strain rates. Large particles were also found to cross the gas stagnation plane, stagnate, and eventually reverse as a result of the opposing gas phase velocity. It was also shown that the particle number density varies substantially throughout the flowfield, as a result of the straining of the flow and the thermal expansion. Finally, for increased values of the particle number density, substantial flame cooling to extinction states and modification of the gas phase fluid mechanics were observed. As also expected, the effect of gravity was shown to be important for low convective velocities and heavy particles. Under such conditions, simulations indicate that the magnitude and direction of the gravitational force can substantially affect the profiles of the particle velocity, number density, mass flux, and temperature.
Author
Dynamic Characteristics; Dust; Flames; Flow Distribution; Fluid Mechanics; Reaction Kinetics

20020027537 SRI International Corp., Menlo Park, CA USA
Flame Chemiluminescence Rate Constants for Quantitative Microgravity Combustion Diagnostics
Luque, Jorge, SRI International Corp., USA; Smith, Gregory P., SRI International Corp., USA; Jeffries, Jay B., SRI International Corp., USA; Crosley, David R., SRI International Corp., USA; [2001]; 12p; In English; 39th AIAA Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAS3-99143; RTOP 101-12-00
Report No.(s): AIAA Paper 2001-0626; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Absolute excited state concentrations of OH(A), CH(A), and C2(d) were determined in three low pressure premixed methane-air flames. Two dimensional images of chemiluminescence from these states were recorded by a filtered CCD camera,

processed by Abel inversion, and calibrated against Rayleigh scattering, Using a previously validated 1-D flame model with known chemistry and excited state quenching rate constants, rate constants are extracted for the reactions CH + O2 (goes to) OH(A) + CO and C2H + O (goes to) CH(A) + CO at flame temperatures. Variations of flame emission intensities with stoichiometry agree well with model predictions.
Author
Chemiluminescence; Combustion; Microgravity; Flame Propagation; Reaction Kinetics; Stoichiometry

20020027539 Sandia National Labs., Livermore, CA USA
Pulsating Hydrodynamic Instability in a Dynamic Model of Liquid-Propellant Combustion
Margolis, Stephen B., Sandia National Labs., USA; [1999]; 20p; In English; 35th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 20-24 Jun. 1999, Los Angeles, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): DE-AC04-94AL-85000; NASA Order C-32031-E; RTOP 101-15-05
Report No.(s): AIAA Paper 99-2777; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Hydrodynamic (Landau) instability in combustion is typically associated with the onset of wrinkling of a flame surface, corresponding to the formation of steady cellular structures as the stability threshold is crossed. In the context of liquid-propellant combustion, such instability has recently been shown to occur for critical values of the pressure sensitivity of the burning rate and the disturbance wavenumber, significantly generalizing previous classical results for this problem that assumed a constant normal burning rate. Additionally, however, a pulsating form of hydrodynamic instability has been shown to occur as well, corresponding to the onset of temporal oscillations in the location of the liquid/gas interface. In the present work, we consider the realistic influence of a nonzero temperature sensitivity in the local burning rate on both types of stability thresholds. It is found that for sufficiently small values of this parameter, there exists a stable range of pressure sensitivities for steady, planar burning such that the classical cellular form of hydrodynamic instability and the more recent pulsating form of hydrodynamic instability can each occur as the corresponding stability threshold is crossed. For larger thermal sensitivities, however, the pulsating stability boundary evolves into a C-shaped curve in the disturbance-wavenumber/ pressure-sensitivity plane, indicating loss of stability to pulsating perturbations for all sufficiently large disturbance wavelengths. It is thus concluded, based on characteristic parameter values, that an equally likely form of hydrodynamic instability in liquid-propellant combustion is of a nonsteady, long-wave nature, distinct from the steady, cellular form originally predicted by Landau.
Author
Dynamic Models; Liquid Rocket Propellants; Combustion Stability; Unsteady Flow; Flow Stability; Perturbation

20020027542 University of Southern California, Dept. of Aerospace and Mechanical Engineering, Los Angeles, CA USA
Radiation-Driven Flame Spread Over Thermally-Thick Fuels in Quiescent Microgravity Environments
Honda, Linton K., University of Southern California, USA; Son, Youngjin, University of Southern California, USA; Ronney, Paul D., University of Southern California, USA; [2001]; 9p; In English; 39th AIAA Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NCC3-671; NAG3-1611; RTOP 101-32-OD
Report No.(s): AIAA Paper 2001-0467; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Microgravity experiments on flame spread over thermally thick fuels were conducted using foam fuels to obtain low density and thermal conductivity, and thus large spread rate (Sf) compared to dense fuels such as PMMA. This scheme enabled meaningful results to lie obtained even in 2.2 second drop tower experiments. It was found that, in contrast conventional understanding; steady spread can occur over thick fuels in quiescent microgravity environments, especially when a radiatively active diluent gas such as CO2 is employed. This is proposed to be due to radiative transfer from the flame to the fuel surface. Additionally, the transition from thermally thick to thermally thin behavior with decreasing bed thickness is demonstrated.
Author
Microgravity; Flame Propagation; Fuels; Flame Temperature; Radiative Heat Transfer

20020027671 Brookhaven National Lab., Upton, NY USA
Transitions in Electrochemical Noise During Pitting Corrosion of Aluminum in Chloride Environments
Sasaki,; Isaacs,; Levy,; Sep. 02, 2001; 7p; In English
Report No.(s): DE2001-789436; BNL-68739; No Copyright; Avail: Department of Energy Information Bridge

Aluminum, in a chloride containing solutions close to its pitting potential, shows vigorous fluctuations in current and potential. Measurements have been made of the freely corroding potential, and the currents between interconnected electrodes. It is shown that there is a transition in the behavior of the transients. The transition occurs when multiple active pits are present

and electrochemical communication occurs between them. The major source of current and potential transients is the growth process in the active pits rather than meta-stable pitting at the passive surface.
NTIS
Aluminum; Chlorides; Corrosion; Pitting

20020028155 North Carolina Univ., Dept. of Chemistry, Chapel Hill, NC USA
The Mechanism and Dynamics of Explosive Combustion in Aerosol Fuels ***Final Report, 1 Apr. 1999-30 Nov. 2001***
Miller, Roger; Baer, Tomas; Nov. 2001; 5p; In English
Contract(s)/Grant(s): F49620-99-1-0064; AF Proj. 2303
Report No.(s): AD-A398653; AFRL-SR-BL-TR-02-28; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Our initial experiments explored the mechanism of vaporization/ionization in liquid and nitrobenzene aerosols using CO2 laser evaporation and 193 micrometer excimer laser ionization. Those experiments were critical in characterizing the capabilities of our apparatus and in laying the framework for the behavior of non-reactive species in our two-laser design. The use of multi-photon ionization schemes with the excimer laser resulted in highly fragmented mass spectra, making the identification of reaction products difficult. Therefore, in preparation for studies of more reactive, high-energy materials, we developed a vacuum-ultraviolet (VUV) laser, which ionizes molecules with very little fragmentation. We developed the VUV laser using funds from this grant. The VUV ionization technique makes our approach quite flexible and powerful in the elucidation of reaction mechanisms.
DTIC
Aerosols; Excimer Lasers; Fuels; Ionization; Explosives; Nitromethane; Ultraviolet Lasers

20020028173 Wright State Univ., Dayton, OH USA
International Workshop on ZnO ***Final Report***
Look, David C.; Dec. 12, 2001; 54p; In English
Contract(s)/Grant(s): N00014-99-1-1054
Report No.(s): AD-A398386; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A workshop solely dedicated to the electronic and photonic properties of ZnO materials and devices was held in Dayton, OH, October 7-8, 1999, and was attended by 70 scientists and engineers from ten different countries.
DTIC
Zinc Oxides; Conferences; Electrical Properties; Optical Properties

20020028358 University of South Florida, Tampa, FL USA
Corrosion Forecasting for 75-Year Durability Design of Reinforced Concrete ***Final Report, Aug. 1996 - May 01***
Sagues, A. A.; Kranc, S. C.; Presuel-Moreno, F.; Rey, D.; Torres-Acosta, A.; Dec. 31, 2001; 180p; In English
Report No.(s): PB2002-102302; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
About two thirds of the 5,500 bridges in the Florida Department of Transportation (FDOT) inventory are exposed to salt water. The resulting corrosion of reinforcement has in the past created serious limitations to the durability of the substructure of those bridges, resulting in continuing need for costly repairs or early replacement of the structure. The nationwide mandate for 75-year durability construction represents therefore an especially difficult challenge when designing new bridges for these aggressive service marine applications. The present investigation was conducted with the main objective of improving forecasting ability by updating information on the rate of chloride ion penetration, with special attention to the effect of cracks, in the substructure of FDOT marine bridges constructed with the most promising concrete formulations.
NTIS
Corrosion; Durability; Composite Materials; Concretes

20020028934 Brookhaven National Lab., Upton, NY USA
Performance of liqui-cel extra-flow membrane contractor in a pure water and in a 0.2% sodium chloride solution (sno-str-2001-11)
Yeh,; Boger,; Hahn,; Nov. 05, 2001; 9p; In English
Report No.(s): DE2001-789651; BNL-68715; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
After completion of SNO's first phase measurement of the neutrino charge current, two tons of salt were added into the SNO heavy water to increase the sensitivity of the neutral current measurement (Phase II). Liqui-Cel Extra-Flow Membrane Contactors (simply called Liqui-Cel) are used in the SNO heavy-water circulating system to remove the dissolved gases, such as oxygen, nitrogen, radon, and water vapor from the liquid water. One possible scenario with phase II operation is that the salt may leak

through the Liqui-Cel membrane and come in contact with the vacuum pumps and other metal components of the Heavy-Water Vapor Recovery System. In this scenario, corrosion will damage these components, especially the vacuum pump (pfeiffer UniDry Pump with cast iron interior), and increase the operational difficulties. A series of tests for the behavior of the Liqui-Cel System in pure water and in salt systems was conducted at the Brookhaven National Laboratory in order to measure the transfer of (a) water vapor and (b) salt, if there is any, through the membrane. Initially, a 10-inch by 28-inch Liqui-Cel unit, identical to those used in the SNO heavy-water circulating system, was obtained from SNO site. However, extensive analysis showed that the membrane in this unit was defective; a replacement membrane would cost several thousand dollars. Instead, a smaller, 2.5-inch x 8-inch Liqui-Cel, obtained from Dr. Richard Helmers of the University of British Columbia, was used in this experiment. A comparison of the present experiment with the SNO heavy-water system is done with theoretical calculations. The results are discussed in the following sections.
NTIS
Membranes; Water; Neutrinos

20020029254 National Energy Technology Lab., Pittsburgh, PA USA
CO2 Selective Ceramic Membrane for Water-Gas Shift Reaction with Concomitant Recovery of CO2
Liu, P. K. T.; Sep. 30, 2001; 45p; In English
Report No.(s): DE2001-789616; FC26-00NT40922-07; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Our study using TG/MS concludes that the CO2 affinity of the hydrotalcite material is reversible at approx. 200 C and in the presence of water. Surface study via FTIR, DRIFTS and TGA/MS have been used to quantitatively characterize the thermal behavior of the hydrotalcite material. Based upon these characterization results, a thermal evolution pattern accounting for the loss of interlayer water, hydroxyl group, and CO2 is proposed for the hydrotalcite we studied. A small amount of CO2 release (-2wt%) was observed at -220degC, while the remaining releases at approx. 450 C. Both regions are possible candidates for transport of CO2 in a membrane configuration. Presently, we are conducting high-pressure absorption/desorption study to verify the reversibility of the CO2 released from these two regions at the proposed operating condition.
NTIS
Carbon Dioxide; Membranes; Temperature Effects; Ceramics; Thermogravimetry

20020029255 National Energy Technology Lab., Pittsburgh, PA USA
SiC-Based Hydrogen Selective Membranes for Water-Gas-Shift Reaction
Liu, P. K. T.; Oct. 16, 2001; 31p; In English
Report No.(s): DE2001-789612; FG26-99FT40683-01; No Copyright; Avail: Department of Energy Information Bridge

This technical report summarizes our activities conducted in Yr II. In Yr I we successfully demonstrated the feasibility of preparing the hydrogen selective SiC membrane with a chemical vapor deposition (CVD) technique. In addition, a SiC macroporous membrane was fabricated as a substrate candidate for the proposed SiC membrane as an intermediate layer between the substrate and the final membrane layer prepared from CVD. Powders and supported thin silicon carbide films (membranes) were prepared by a sol-gel technique using silica sol precursors as the source of silicon, and phenolic resin as the source of carbon. The powders and films were prepared by the carbothermal reduction reaction between the silica and the carbon source. The XRD analysis indicates that the powders and films consist of SiC, while the surface area measurement indicates that they contain micropores. SEM and AFM studies of the same films also validate this observation. The powders and membranes were also stable under different corrosive and harsh environments. The effects of these different treatments on the internal surface area, pore size distribution, and transport properties, were studied for both the powders and the membranes using the aforementioned techniques and XPS. Finally the SiC membrane materials are shown to have satisfactory hydrothermal stability for the proposed application. In Yr III, we will focus on the demonstration of the potential benefit using the SiC membrane developed from Yr I and II for the water-gas-shift (WGS) reaction.
NTIS
Hydrogen; Silicon Carbides; Sol-Gel Processes; Silicon Dioxide; Microporosity

20020029260 Argonne National Lab., IL USA
Aggregation of the neodymium complexes of HDEHP, Cyanex 272, Cyanex 302, and Cyanex 301 in toluene
Jensen, M. P.; Chiarizia, R.; Urban, V.; Nash, K. L.; Oct. 18, 2001; 8p; In English
Report No.(s): DE2001-789709; ANL/CHM/CP-105568; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Visible absorption spectroscopy and small-angle neutron scattering have been used to study the morphology and aggregation of a series of purified acidic organophosphorus extractants with oxygen and sulfur donor atoms and the Nd(III) complexes of these extractants in toluene solutions. The extractants bis(2-ethylhexyl)phosporic acid (HDEHP), bis(2,2,4-trimethyl pentyl)phosphinic acid (HC272), bis(2,4,4-trimethylpentyl) monothiophosphinic acid (HC302), and Bis(2,4,4-trimethylpentyl) dithiophosphinic acid (HC301) were studied. The phosphinic acid based extractants are the primary constituents of the commercial extractants Cyanex 272, Cyanex 302, and Cyanex 301 respectively. Small-angle neutron scattering experiments show that although 0.10 M solutions of the oxygen containing extractants HDEHP and HC302 are dimeric in toluene, HC301, which contains only sulfur donor atoms, is monomeric within the uncertainty of the experiment. When high concentrations of Nd (greater than 30% theoretical Nd capacity) are extracted into the organic phases, the oxygen containing extractants, HDEHP, HC272, and HC302 all form dinuclear complexes with a 2:6 metal:extractant ratio. The sulfur bearing extractant HC301, on the other hand, forms only 1:3 meal:extractant complexes when the Nd loading is less than 50% of the theoretical capacity of the solution. However, at higher Nd loading, 86% of the theoretical capacity, 2:6 Nd:C301 complexes are formed.
NTIS
Neodymium; Trimethyl Compounds; Solvent Extraction; Neutron Scattering

20020029287 Sandia National Labs., Albuquerque, NM USA
Annotated Bibliography of Thermal Radiation Validation Data for Fire Applications
Howell, J. R.; Daun, K.; Erturk, H.; Nov. 01, 2001; 96p; In English
Report No.(s): DE2001-789574; SAND2001-3320; No Copyright; Avail: Department of Energy Information Bridge
This report details experimental data useful in validating radiative transfer codes involving participating media, particularly for cases involving combustion. Special emphasis is on data for pool fires. Features sought in the references are: Flame geometry and fuel that approximate conditions for a poll fire of a well defined flame geometry and characteristics that can be completely modeled; detailed information that could be used as code input data, including species concentration and temperature profiles and associated absorption coefficients, soot morphology and concentration profiles, associated scattering coefficients and phase functions, specification of system geometry, and system boundary conditions; detailed information that could be compared against code output predictions, including measured boundary radiative energy flux distributions (preferably spectral) and/or boundary temperature distributions; and a careful experimental error analysis so that code predictions could be rationally compared with experimental measurements. Reference data were gathered from more than 35 persons known to be active in the field of radiative transfer and combustion, particularly in experimental work. A literature search was carried out using key words. Additionally, the reference lists in papers/reports were pursued for additional leads. The report presents extended abstracts of the cited references, with comments on available and missing data for code validation, and comments on reported error. A graphic for quick reference is added to each abstract that indicates the completeness of data and how well the data mimics a large-scale pool fire. The references are organized into Lab-Scale Pool Fires, Large-Scale Pool Fires, Momentum-Driven Diffusion Flames, and Enclosure Fires. As an additional aid to report users, the Tables in Appendix A show the types of data included in each reference. The organization of the tables follows that used for the abstracts.
NTIS
Thermal Radiation; Fires; Temperature Profiles; Radiative Transfer; Bibliographies

20020029720 NASA Glenn Research Center, Cleveland, OH USA
Thermodynamic Activity Measurements with Knudsen Cell Mass Spectrometry
Copland, Evan H., NASA Glenn Research Center, USA; Jacobson, Nathan S., NASA Glenn Research Center, USA; [2001]; 16p; In English
Contract(s)/Grant(s): RTOP 708-31-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Coupling the Knudsen effusion method with mass spectrometry has proven to be one of the most useful experimental techniques for studying the equilibrium between condensed phases and complex vapors. The Knudsen effusion method involves placing a condensed sample in a Knudsen cell, a small ”enclosure”, that is uniformly heated and held until equilibrium is attained between the condensed and vapor phases. The vapor is continuously sampled by effusion through a small orifice in the cell. A molecular beam is formed from the effusing vapor and directed into a mass spectrometer for identification and pressure measurement of the species in the vapor phase. Knudsen cell mass spectrometry (KCMS) has been used for nearly fifty years now and continues to be a leading technique for obtaining thermodynamic data. Indeed, much of the well-established vapor specie data in the JANAF tables has been obtained from this technique. This is due to the extreme versatility of the technique. All classes of materials can be studied and all constituents of the vapor phase can be measured over a wide range of pressures (approximately 10(exp -4) to 10(exp -11) bar) and temperatures (500-2800 K). The ability to selectively measure different vapor species makes KCMS a very powerful tool for the measurement of component activities in metallic and ceramic solutions. Today several groups

are applying KCMS to measure thermodynamic functions in multicomponent metallic and ceramic systems. Thermodynamic functions, especially component activities, are extremely important in the development of CALPHAD (Calculation of Phase Diagrams) type thermodynamic descriptions. These descriptions, in turn, are useful for modeling materials processing and predicting reactions such as oxide formation and fiber/matrix interactions. The leading experimental methods for measuring activities are the Galvanic cell or electro-motive force (EMF) technique and the KCMS technique. Each has specific advantages, depending on material and conditions. The EMF technique is suitable for lower temperature measurements, provided a suitable cell can be constructed. KCMS is useful for higher temperature measurements in a system with volatile components. In this paper, we briefly review the KCMS technique and identify the major experimental issues that must be addressed for precise measurements. These issues include temperature measurements, cell material and cell design and absolute pressure calibration. The resolution of these issues are discussed together with some recent examples of measured thermodynamic data.
Author
Thermodynamics; Knudsen Gages; Knudsen Flow; Mass Spectroscopy; Condensing; Vapor Phases

20020029915 National Energy Technology Lab., Pittsburgh, PA USA
Power systems development facility
Aug. 01, 1998; 645p; In English
Report No.(s): DE2001-772395; DE-FC21-90MC25140-25; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report discusses the commissioning and operation of the transport reactor train and associated balance-of-plant equipment at the Power Systems Development Facility (PSDF) located in Wilsonville, Alabama. The transport reactor is an advanced circulating fluidized bed reactor designed to operate as either a combustor or a gasifier using one of two possible hot gas clean-up filter technologies (particulate control device technology, or PCDs) at a component size readily scaleable to commercial systems. During the shakedown, commissioning, and initial operation phases, the transport reactor was operated as a pressurized combustor. A Westinghouse supplied filter system was commissioned and operated along with the transport reactor.
NTIS
Coal; Combustion; Systems Engineering; High Temperature Gases; Particulates

20020030197 Center for Mathematics and Computer Science, Amsterdam Netherlands
Gel Placement in Porous Media. Part 1. Constant Injection Rate. Modelling, Analysis and Simulation
Vermolen, F. J.; Bruining, J.; van Duijn, C. J.; Sep. 30, 1999; 28p; In English
Report No.(s): PB2002-103678; MAS-R9928; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

In this paper we analyse advective transport of polymers, crosslinkers and gel, taking into account non-equilibrium gelation, gel adsorption and crosslinker precipitation. In absence of diffusion/dispersion the resulting model consists of hyperbolic transport-reaction equations. These equations are studies in several steps using mainly analytical techniques. For simple cases, we obtain explicit traveling wave solutions, whereas for more complicated cases we rely on analytical techniques to analyse the problem qualitatively. Finally, a numerical solution for the full system of equations is obtained. The results developed in this study can be used to validate numerical solutions obtained from commercial simulators. Hyperbolic equations traveling wave gelation adsorption porous media.
NTIS
Polymers; Traveling Waves; Hyperbolic Differential Equations; Numerical Analysis; Diffusion

20020030231 Argonne National Lab., IL USA
Corrosion of glass-bonded sodalite and its components as a function of pH and temperature
Jeong, S. Y.; Morss, L. R.; Ebert, W. L.; Dec. 04, 2001; 9p; In English
Report No.(s): DE2001-789737; ANL/CMT/CP-106353; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A glass-bonded sodalite ceramic waste form (CWF) has been developed to immobilize electrorefiner salt wastes from electrometallurgical treatment of spent sodium-bonded reactor fuel for disposal. A degradation model is being developed to support qualification of the CWF for disposal in the federal high-level waste disposal system. The parameter values in the waste form degradation model were previously determined from the dissolution rates measured in MCC-1 tests conducted at 40, 70, and 90degC. The results of several series of tests that were conducted to confirm the applicability of the dissolution rate model and model parameters were presented in this paper: (1) Series of MCC-1 tests were conducted in five dilute buffer solutions in the pH range of 4.8-9.8 at 20degC with HIP sodalite, HIP glass and HIP CWF. The results show that the model adequately predicts the dissolution rate of these materials at 20degC. (2) Tests at 20 and 70degC with CWF made by pressureless-consolidation (PC

CWF) indicate that the model parameters extracted from the results of tests with HIP CWF can be applied to PC CWF. (3) The dissolution rates of a glass made with a composition corresponding to 80% glass and 20% sodalite were measured at 70degC to evaluate the sensitivity of the rate to the composition of binder glass in the CWF. The dissolution rates of the modified binder glass were indistinguishable from the rates of the binder glass.
NTIS
Corrosion; Waste Disposal; Glass; Sodalite; Degradation

20020031241 California Univ., Los Angeles, CA USA
Numerical Simulations of Acoustically Driven, Burning Droplets
Kim, H.-C., California Univ., USA; Karagozian, A. R., California Univ., USA; Smith, O. I., California Univ., USA; [1999]; 18p; In English; Western States Section Fall Meeting, Oct. 1999, Los Angeles, CA, USA; Sponsored by Combustion Inst., USA
Contract(s)/Grant(s): NCC3-690; NCC3-783; RTOP 101-13-0B
Report No.(s): Paper-99F-50; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This computational study focuses on understanding and quantifying the effects of external acoustical perturbations on droplet combustion. A one-dimensional, axisymmetric representation of the essential diffusion and reaction processes occurring in the vicinity of the droplet stagnation point is used here in order to isolate the effects of the imposed acoustic disturbance. The simulation is performed using a third order accurate, essentially non-oscillatory (ENO) numerical scheme with a full methanol-air reaction mechanism. Consistent with recent microgravity and normal gravity combustion experiments, focus is placed on conditions where the droplet is situated at a velocity antinode in order for the droplet to experience the greatest effects of fluid mechanical straining of flame structures. The effects of imposed sound pressure level and frequency are explored here, and conditions leading to maximum burning rates are identified.
Author
Burning Rate; Drops (Liquids); Perturbation; Microgravity; Combustion

20020031713 Sandia National Labs., Combustion Research Facility, Livermore, CA USA
Hydrodynamic Instability in an Extended Landau/Levich Model of Liquid-Propellant Combustion
Margolis, Stephen B., Sandia National Labs., USA; [1998]; 22p; In English; 36th Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): DE-AC04-94AL-85000; NASA Order C-320431-E; RTOP 101-15-05
Report No.(s): AIAA Paper 98-0248; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The classical Landau/Levich models of liquid propellant combustion, which serve as seminal examples of hydrodynamic instability in reactive systems, have been combined and extended to account for a dynamic dependence, absent in the original formulations, of the local burning rate on the local pressure and/or temperature fields. The resulting model admits an extremely rich variety of both hydrodynamic and reactive/diffusive instabilities that can be analyzed in various limiting parameter regimes. In the present work, a formal asymptotic analysis, based on the realistic smallness of the gas-to-liquid density ratio, is developed to investigate the combined effects of gravity, surface tension and viscosity on the hydrodynamic instability of the propagating liquid/gas interface. In particular, a composite asymptotic expression, spanning three distinguished wavenumber regimes, is derived for both cellular and pulsating hydrodynamic neutral stability boundaries A(sub p)(k), where A(sub p) is the pressure sensitivity of the burning rate and k is the disturbance wavenumber. For the case of cellular (Landau) instability, the results demonstrate explicitly the stabilizing effect of gravity on long-wave disturbances, the stabilizing effect of viscosity and surface tension on short-wave perturbations, and the instability associated with intermediate wavenumbers for critical negative values of A(sub p). In the limiting case of weak gravity, it is shown that cellular hydrodynamic instability in this context is a long-wave instability phenomenon, whereas at normal gravity, this instability is first manifested through O(l) wavenumber disturbances. It is also demonstrated that, in the large wavenumber regime, surface tension and both liquid and gas viscosity all produce comparable stabilizing effects in the large-wavenumber regime, thereby providing significant modifications to previous analyses of Landau instability in which one or more of these effects were neglected. In contrast, the pulsating hydrodynamic stability boundary is found to be insensitive to gravitational and surface-tension effects, but is more sensitive to the effects of liquid viscosity, which is a significant stabilizing effect for O(l) and higher wavenumbers. Liquid-propellant combustion is predicted to be stable (i.e., steady and planar) only for a range of negative pressure sensitivities that lie between the two types of hydrodynamic stability boundaries.
Author
Flow Stability; Liquid Rocket Propellants; Propellant Combustion; Gravitational Effects; Interfacial Tension; Viscosity; Liquid-Vapor Interfaces

20020031757 Army Construction Engineering Research Lab., Champaign, IL USA

A Fundamental Study of Biofiltration Processes for VOC Removal From Waste Gas Streams ***Final Report***

Kim, Byung J.; Suidan, Makram T.; Zhu, Xuequing; Alonso, Cristina; Nov. 2001; 111p; In English; Original contains color images

Report No.(s): AD-A398734; ERDC/CERL-TR-01-48; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Most volatile organic compounds (VOCs) are deemed carcinogenic, and some are precursors to ozone production. Large amounts of VOCs are emitted to the atmosphere from chemical industries, food processing industries, and waste management facilities. The Clean Air Act Amendments of 1990 has meant that control and removal of VOCs from contaminated gas streams have become of increasing concern in recent years. Biological treatment, especially biofiltration, has emerged as a promising air pollution control technology for VOC removal because of its cost-effectiveness for certain waste gas streams when compared with other conventional VOC control options. Biofiltration uses microorganisms to degrade various pollutants. A waste gas stream is purified by passage through a biologically active medium under aerobic conditions. As the waste gas moves through the biofilter, organic compounds pass into the biofilms surrounding the supporting medium and are oxidized into mineral end products or incorporated into the biomass. This report enhances understanding of fundamental of biofilter operation for air treatment through a bench-scale evaluation of a biotrickling filter. This report is a companion to ERDC/CERL TR-00-9, which provided fundamentals of the bioscrubber. This study will enable pilot-scale demonstration of new generation biofilter technology beginning in fiscal year 2002.

DTIC

Volatility; Waste Management

20020031773 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Review and Improvement of Methods for Estimating Rates of Photolysis in Photochemical Models, Volume 2 ***Final Report***

Harley, R. A.; Reynolds, S. D.; Vuilleumier, L.; Brown, N. J.; Dec. 08, 2000; 78p; In English

Report No.(s): PB2002-102320; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This manual describes the TUVAQM module for calculating solar actinic flux and photolysis rates within air quality models (or on a standalone basis), based on the Tropospheric Ultraviolet Visible (TUV) radiation transfer program (version 3.9) by Dr SASha Madronich of the National Center for Atmospheric Research (NCAR). TUVAQM is designed to be callable from another program such as an Air Quality Model (AQM). The package includes library routines, test programs, UNIX installing scripts, and supporting data. The object of TUVAQM is to compute the solar actinic flux at a given location and time given specific atmospheric conditions. Photolysis reaction rate coefficients can be computed by TUVAQM providing the cross sections and quantum yields are available. The relationship between solar actinic flux and photolysis reaction rates, as well as the definition of these quantities is discussed in section 2. Section 2 also summarizes the theoretical background that supports the radiation transfer model.

NTIS

Photolysis; Photochemical Reactions; Radiative Transfer; Reaction Kinetics; Tropospheric Radiation

20020031776 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Review and Improvement of Methods for Estimating Rates of Photolysis in Photochemical Models, Volume 1 ***Final Report***

Vuilleumier, L.; Brown, N. J.; Harley, R. A.; Reynolds, S. D.; Dec. 08, 2000; 108p; In English

Report No.(s): PB2002-102481; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Photolysis of species such as NO2 and formaldehyde influence significantly the formation of photochemical air pollution. Improved description of spatial and temporal variations in photolysis rates is needed, and improving the description of ultraviolet light intensity is key to improving urban and regional air quality models in this respect. Radiative transfer models were reviewed, and the Tropospheric Ultraviolet-Visible (TUV) model was implemented as a flexible photolysis module for online use within air quality models. Radiation measurements from the 1997 Southern California Ozone Study were used to assess the contributions of aerosols and ozone to variability in atmospheric optical depth. Aerosols were found to account for 90% or more of the observed variability in optical depth. Sensitivity analysis was combined with an assessment of the likely range of variation for key TUV inputs parameters to estimate their influence on photolysis rate uncertainty. The amount of aerosol and its relative efficiency in scattering versus absorbing UV radiation each were found to lead to -10% uncertainties in photolysis rate coefficients.

NTIS

Photolysis; Photochemical Reactions; Luminous Intensity; Ultraviolet Radiation; Atmospheric Chemistry

20020031779 National Defence Research Establishment, Avedelningen foer NBC Skydd, Umea, Sweden

Center of Molecular Design (CDM), Washington University, St Louis, USA under Hoesten 1999 (Assignment as Research Visitor at Center of Molecular Design (CMD), Washington University in St. Louis, USA in the Fall of 1999 ***Vietelse som Gaestforskare vid***

Tunemalm, A. K.; May 2000; 22p; In Swedish

Report No.(s): PB2002-102552; FOA-R-00-01513-862-SE; No Copyright; Avail: National Technical Information Service (NTIS)

During 14 weeks in 1999, the author was positioned as a research visitorin Professor Garland Marshall's group, Center of Molecular design (CMD) at the Institute of Biomedical Computing, School of Medicine, WashingtonUniversity in St. Louis, Missouri, U.S.A. The objective of the visit wasto investigate the usefulness of computational methods for the study of enzyme/receptor- inhibitor/substrate interactions. The project consisted of three parts: 1. Studies of the interaction between phosphorous organic compounds with acetylcholinesterase, 2. A university course in Computational Biochemistry. Teachers: Prof. Garland Marshall and Prof. Jay Ponder, and 3. Design of peptidomimetics for the G-protein transducins' interaction with the light receptor rhodopsin.

NTIS

Acetyl Compounds; Cholinesterase; Organic Compounds; Proteins; Enzymes

20020032297 Sandia National Labs., Combustion Research Facility, Livermore, CA USA

Pulsating Hydrodynamic Instability and Thermal Coupling in an Extended Landau/Levich Model of Liquid-Propellant Combustion, 1, Inviscid Analysis

Margolis, Stephen B., Sandia National Labs., USA; Combustion Theory Modelling 3; [1999]; ISSN 1364-7830; Volume 3, pp. 613-635; In English

Contract(s)/Grant(s): NASA Order C-32031-E; DE-AC04-94AL-85000; RTOP 101-15-05; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Hydrodynamic (Landau) instability in combustion is typically associated with the onset of wrinkling of a flame surface, corresponding to the formation of steady cellular structures as the stability threshold is crossed. In the context of liquid-propellant combustion, such instability has recently been shown to occur for critical values of the pressure sensitivity of the burning rate and the disturbance wavenumber, significantly generalizing previous classical results for this problem that assumed a constant normal burning rate. Additionally, however, a pulsating form of hydrodynamic instability has been shown to occur as well, corresponding to the onset of temporal oscillations in the location of the liquid/gas interface. In the present work, we consider the realistic influence of a non-zero temperature sensitivity in the local burning rate on both types of stability thresholds. It is found that for sufficiently small values of this parameter, there exists a stable range of pressure sensitivities for steady, planar burning such that the classical cellular form of hydrodynamic instability and the more recent pulsating form of hydrodynamic instability can each occur as the corresponding stability threshold is crossed. For larger thermal sensitivities, however, the pulsating stability boundary evolves into a C-shaped curve in the (disturbance-wavenumber, pressure-sensitivity) plane, indicating loss of stability to pulsating perturbations for all sufficiently large disturbance wavelengths. It is thus concluded, based on characteristic parameter values, that an equally likely form of hydrodynamic instability in liquid-propellant combustion is of a non-steady, long-wave nature, distinct from the steady, cellular form originally predicted by Landau.

Author

Burning Rate; Liquid Rocket Propellants; Propellant Combustion; Flow Stability; Hydrodynamics; Mathematical Models

20020032304 NASA Ames Research Center, Moffett Field, CA USA

The Rovibrational Intensities of the (40 deg 1) and (00 deg 0) Pentad Absorption Bands of 12C16O2 Between 7284 and 7921 cm(exp-1)

Giver, L. P., NASA Ames Research Center, USA; Chackerian, C., Jr., NASA Ames Research Center, USA; Spencer, N., NASA Ames Research Center, USA; Brown, L. R., Jet Propulsion Lab., California Inst. of Tech., USA; Wattson, R. B., Stewart Radiance Lab., USA; [1995]; 1p; In English

Contract(s)/Grant(s): RTOP 154-50-80; No Copyright; Avail: Issuing Activity; Abstract Only

Carbon dioxide is the major constituent of the atmospheres of both Mars and Venus. Correct interpretations of spectra of these atmospheres require accurate knowledge of a substantial number of absorption bands of this gas. This is especially true for Venus; many weak CO2 bands that are insignificant in the earth's atmosphere are prominent absorbers in Venus' hot, dense lower atmosphere. Yet, recent near-infrared spectra of Venus' nightside have discovered emission windows, which occur between CO2 absorption bands, at 4040-4550 cm(exp-1), 5700-5900 cm(exp-1), and several smaller ones between 7500 and 9400 cm(exp-1). This radiation is due to thermal emission from Venus' lower atmosphere, diminished by scattering and absorption within the

sulfuric acid clouds on its way to space. Simulations of these data with radiative transfer models can provide improved information on the abundances of a number of constituents of the lower atmosphere (e.g. H2O, CO, HDO, HCl, HF, and OCS) and the optical properties of the clouds, whose spatial variation modulates the brightness of the emissions. However, the accuracy of these retrievals has been limited by insufficient knowledge of the opacity of some of the gas species, including CO2, at the large pathlengths and high temperatures and pressures that exist on Venus. In particular, modeling the emission spectrum did not produce a good fit for the emission window centered at 7830 cm(exp-1). In an ongoing effort to assist analyses of these Venus spectra, we have been making laboratory intensity measurements of several weak bands of CO2 which are significant absorbers in these Venus emission windows. The CO2 bands that are prominent in the 7830 cm(exp-1) region belong to the vibrational sequence 4v1+v3 and associated hot bands. Only 2 of the 5 bands of this sequence have been previously measured. Modeling Venus' emission spectrum in the 7830 cm(exp-1) region had to rely on calculated intensity values for the weak ground state band at 7921 cm-1 and the associated hot bands. Since the calculated intensities of ground state bands are known to have significant uncertainties, we decided to measure this (40 deg 1)I (left arrow) (00 deg 0) band with the Ames 25 meter multiple reflection absorption cell and Fourier transform spectrometer. We also measured the (40 deg 1) (sub IV) (left arrow) (00 deg 0) band at 7460 cm(exp-1), which also had not been previously measured. These measurements are reported in this article, and we also give our reanalysis of the prior measurements of the (40 deg 1) (sub III) (left arrow) (00 deg 0) bands. These measurements provide the basis for improving calculated intensities for related hot bands as well as simulations of Venus' spectrum.
Author
Absorption Spectra; Intensity; Vibrational Spectra; Venus (Planet); Spectrum Analysis; Carbon Dioxide

20020032631 NASA Ames Research Center, Moffett Field, CA USA
The Rovibrational Fundamental Band: Temperature Dependence of N2-Broadening Coefficients
Spencer, M. N., NASA Ames Research Center, USA; Chackerian, C., Jr., NASA Ames Research Center, USA; Giver, L. P., NASA Ames Research Center, USA; Brown, L. R., Jet Propulsion Lab., California Inst. of Tech., USA; [1995]; 1p; In English; 50th International Symposium on Molecular Spectroscopy, 12-16 Jun. 1995, Columbus, OH, USA
Contract(s)/Grant(s): RTOP 154-50-80; No Copyright; Avail: Issuing Activity; Abstract Only

Rovibrational spectra of the vibrational fundamental of nitric oxide have been recorded under N2-broadening conditions at 0.0056 cm(exp-1) resolution using the Solar McMath FTS at the Kitt Peak National Observatory. The temperature range for the experiments was 296 K to 183 K. The 30 cm absorption cell used for the measurements is cooled with a helium compressor and can operate at temperatures down to 60 K; vibration isolation of the cell allows its use with high performance Fourier Transform Spectrometers. From these spectra, N2-broadened line widths have been determined thru m = 16.5. Qualitative as well as quantitative discrepancies are observed between our experimental determinations of the temperature dependence of the broadening and theoretical calculations.
Author
Nitrogen; Temperature Dependence; Fourier Transformation; Vibrational Spectra; Rotational Spectra

20020032684 NASA Ames Research Center, Moffett Field, CA USA
Carbon Isotope Fractionations Associated with Methanotrophic Growth with the Soluble and Particulate Methane Monooxygenases
Jahnke, Linda L.; Summons, Roger E.; [1996]; 1p; In English; 96th American Chemical Society Meeting, 20-23 May 1996, New Orleans, LA, USA; Sponsored by American Chemical Society, USA
Contract(s)/Grant(s): RTOP 185-52-32; No Copyright; Avail: Issuing Activity; Abstract Only

Growth experiments with the RuMP-type methanotroph, Methylococcus capsulatus (Bath), have demonstrated that biomass and lipid biomarkers are significantly depleted in C-13 compared to the substrate methane and that the extent of fractionation is dependent on whether cells express the soluble (s) or particulate (p) methane monooxygenase (MMO). The presence or absence of the characteristic sMMO subunits was monitored using SDS-polyacrylamide gels. In M. capsulatus grown with no Cu supplementation, the characteristic sMMO subunits were observed in the soluble fraction throughout the entire growth period and biomass was depleted in C-13 by approximately 14,700 relative to substrate methane. In cells grown with 5uM Cu, no sMMO bands were observed and a greater fractionation of approximately 27,700 in resultant biomass was obtained. Methanol growth experiments with M. capsulatus and with a RuMP methylotroph, Methylophilus methylotrophus, in which biomass measurements yielded depletions in C-13 of 9 and 5%(sub o), respectively, suggest that oxidation of methane is the major fractionation step. Growth of M. capsulatus at a low level of oxygen, approximately 0.5%, had no significant effect on carbon isotope fractionation

by either sMMO or pMMO. These observations are significant for identification of molecular biomarkers; and methanotrophic contributions to carbon isotope composition in natural environments.
Author
Carbon Isotopes; Fractionation; Methane; Particulates

20020033021 NASA Ames Research Center, Moffett Field, CA USA
Investigation of a Diagnostic for Perturbation Theory: Comparison to the T(sub 1) Diagnostic of Coupled-Cluster Theory
Lee, Timothy J., NASA Ames Research Center, USA; Head-Gordon, Martin, California Univ., USA; Rendell, Alistair P., Australian National Univ., Australia; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 232-01-04; No Copyright; Avail: Issuing Activity; Abstract Only

A diagnostic for perturbation theory calculations, S(sub 2), is defined and numerical results are compared to the established T(sub 1) diagnostic from coupled-cluster theory. S(sub 2) is the lowest order non-zero contribution to a perturbation expansion of T(sub 1). S(sub 2) is a reasonable estimate of the importance of non-dynamical electron correlation, although not as reliable as T(sub 1). S(sub 2) values less than or equal to 0.012 suggest that low orders of perturbation theory should yield reasonable results; S(sub 2) values between 0.012-0.015 suggest that caution is required in interpreting results from low orders of perturbation theory; S(sub 2) values greater than or equal to 0.015 indicate that low orders of perturbation theory are not reliable for accurate results. Although not required mathematically, S(sub 2) is always less than T(sub 1) for the examples studied here.
Author
Perturbation Theory; Numerical Analysis

26
METALS AND METALLIC MATERIALS

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

20020027252 Westinghouse Electric Corp., Pittsburgh, PA USA
Development of High Strength Columbium and Tantalum Alloy Tubing ***Quarterly Report, 1 Dec. 1962-28 Feb. 1963***
Buckman, R. W., Jr; Apr. 11, 1963; 20p; In English
Contract(s)/Grant(s): AT(30-1)3108
Report No.(s): AD-A398585; AEC-WANL-PR-(N)-001; No Copyright; Avail: Defense Technical Information Center (DTIC)

The production of tubing from B-66 (Cb-5V-5Mo-iZr) and T-111 (Ta-8W-2Hf) requires the evaluation the extrudability of these alloys at high reduction ratios (i.e., 7:1). Starting billets are being clad in mild steel and will be extruded within the 0 2000-2200 F temperature range. Material for the extrusion evaluation has been procured. The tube blank size of 2.0 in. D. x 1/4 in thick wall will be extruded from a 4.22 0 in D x 1.30 in thick wall starting billet. 0 B-66 tube blanks will be worked initially at 500-800 F and finish drawing operations will be done at room temperature. A portion of the B-66 billet material from the extrusion evaluation will be used for a warm drawing investigation. T-111 tube blanks will be processed at room temperature because of its excellent low temperature ductility. During the next quarter, it is planned that the extrusion parameters will be defined and extrusion of tube blanks completed. In addition, the warm drawing evaluation of B-66 will be initiated.
DTIC
Niobium; Tantalum Alloys; Pipes (Tubes); Fabrication

20020027254 Army Research Lab., Weapons Technology Directorate, Aberdeen Proving Ground, MD USA
Polymeric Material Study for the D-Fuze Windshield ***Final Report***
Hollis, M. S.; Jan. 2002; 31p; In English
Report No.(s): AD-A398588; ARL-MR-525; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Pursuant to a previous report, an effort has been made to continue to find higher performance materials for the design of windshields. A product that the U.S. Army Research Laboratory provides the test and evaluation community is a yawsonde, now termed ”diagnostic fuze” or ”D-fuze”. This device is capable of sensing the inertial environment of a cannon-launched projectile and telemetering the live data to a ground station. In order to telemeter data in flight, the antenna has to radiate through a protective windshield. This windshield is not only transparent to radio frequency radiation but is also a means of ballistic and thermal protection. A recent flight experiment with a prototype artillery projectile revealed a weakness of the nylon 66 windshields to ’blow-by’ gases. The windshields were designed to survive aero-pressures attributable to Mach 3 launch and flight with a significant safety factor. However, blow-by effects were never considered. A cursory study has been performed on selected extruded bar stock polymers, which are readily available without our having to consult a compounding source, for machining

windshields for D-fuzes of various geometries. Ultem(R) 2300 appears to provide the best mechanical, thermal, and electrical properties of the studied polymer materials. However, depending on the thickness of the geometry, a designer may want to reconsider using unfilled Ultem(R) 1000. The cross section of the geometry reduces to a range near 0.03125 inch; there may not be enough glass fiber to reinforce the polyetherimide matrix. Further literature research indicated that the ogive of the M762 fuze is made from injected molded polyetherimide with 30% glass filler.
DTIC
Windshields; Performance Tests; Evaluation; Mechanical Properties

20020027466 Oak Ridge National Lab., TN USA
Characterization of Thermally-Cycled Alumina Scales
Pint, B. A.; Oct. 22, 2001; 17p; In English
Report No.(s): DE2001-788669; P00-106215; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Cross-sectional transmission electron microscopy was used to characterize the alumina scales formed on several Ni-base alumina-formers. The alumina scale microstructure of Ni-20Cr-19Al-0.05Y after 100, 1 h cycles at 1100 C was compared to an isothermally-grown scale. Despite being near the onset of mass loss in cyclic testing, very few defects were noted in either scale microstructure. The more adherent scales that form on Hf-doped NiAl and Ni-49Al-2Cr were also characterized. With the addition of Cr, the formation of a-Cr precipitates at the metal-oxide interface coincided with increased long-term scale spallation. No similar precipitation mechanism was observed to be associated with scale spallation NiCrA1Y.
NTIS
Nickel Alloys; Aluminum Oxides; Microstructure

20020027547 Idaho Univ., Moscow, ID USA
Enhanced Performance Near Net Shape Titanium Alloys by Thermohydrogen Processing ***Final Report, 14 Nov. 1997-13 Nov 2001***
Froes, F. H.; Senkov, O. N.; Qazi, J. I.; Jan. 2001; 7p; In English
Contract(s)/Grant(s): DAAG55-98-1-0008
Report No.(s): AD-A398321; ARO-37738.16-MS-DPS; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This research program was aimed at a detailed understanding of the effect of hydrogen as a temporary alloying element (thermohydrogen processing, THP) on processing parameters, microstructural modifications and final mechanical properties of cast- and-wrought (ingot metallurgy), powder metallurgy and cast titanium alloys. Fundamental results have been obtained which can now be used to develop optimum THP steps to refine the microstructure and improve the mechanical properties of titanium alloys. As a part of this project, the phase diagram of the Ti-6Al-4V - hydrogen system, and a determination of the stable and metastable phases, which occur in this system, have been defined. Kinetics of the beta phase decomposition has been studied and the non-equilibrium TTT (temperature-time-transformation) diagrams of the beta to alpha+beta+hydride transformation have been determined for the alloys with 10, 20, and 30 wt.% hydrogen. Kinetics of decomposition of martensite structures have also been determined for these three hydrogen concentrations. The results have been presented at international meetings, 22 technical papers were published, and 12 papers have been submitted for publication. Additionally a patent was also awarded. The results of the work have been transitioned to an Army SBIR program designed to produce low cost titanium components for armored vehicles.
DTIC
Cast Alloys; Hydrogen; Mechanical Properties; Titanium Alloys

20020027668 Brookhaven National Lab., Upton, NY USA
Chromate Inhibition of the Localized Corrosion of Aluminum: Measurements of Electrochemical Transients
Sasaki,; Isaacs,; Sep. 02, 2001; 8p; In English
Report No.(s): DE2001-789439; BNL-68742; No Copyright; Avail: Department of Energy Information Bridge
We investigated the inhibition by chromate ions of the localized corrosion of aluminum by electrochemical transient measurements. In agreement with other work, the measurements demonstrated that chromate is a cathodic inhibitor for aluminum in open circuit. The reduction of hexavalent chromium to trivalent chromium is assumed to take place on catalyzed sites of the surface. The resulting products inhibit oxygen reduction reactions at these sites, thereby retarding pitting corrosion.
NTIS
Aluminum; Chromates; Corrosion Prevention

20020027669 Brookhaven National Lab., Upton, NY USA

Effect of Anion, pH, and Temperature on the Dissolution Behavior of Aluminum Oxide Films

Lee,; Isaacs,; Sep. 02, 2001; 11p; In English

Report No.(s): DE2001-789438; BNL-68741; No Copyright; Avail: Department of Energy Information Bridge

The growth and dissolution behavior of oxide film on abraded pure Al has been investigated using cyclic polarization and has been found to be highly dependent on solution chemistry and temperature. The nature of the anions, borate, chromate, phosphate, and sulfate, at pH 3 to 11, and temperatures 0 to 60 C were examined. In near neutral solutions the dissolution behavior was greatly affected by each anion. In borate and chromate solutions at near neutral pH and room temperature, the currents continued to decrease with each subsequent cycle due to oxide thickening. In contrast, a significant rate of oxide dissolution occurred to produce reproducible repetitive curves during subsequent cycles in a phosphate and sulfate. Sulfate also produced a distinctly different mode during high field oxide growth. In increasing acidic (pH less than 4) or basic (pH greater than 9) solutions the oxide dissolution rate increased rapidly. The oxide dissolution rate was always enhanced with increasing temperature. At high pH (greater than 9) or elevated temperature (60 C), a current maximum was observed in chromate, due to a diffusion controlled monochromate ion enhanced dissolution reaction at the oxide/solution interface.

NTIS

Anions; Borates; Chromates; Dissolving; Oxide Films; pH

20020027670 Brookhaven National Lab., Upton, NY USA

Formation of Chromate Conversion Coatings on Aluminum and Its Alloys: An In Situ XANES Study

Sasaki,; Isaacs,; Jaffcoate,; Buchhait,; Legat,; Sep. 02, 2001; 9p; In English

Report No.(s): DE2001-789437; BNL-68740; No Copyright; Avail: Department of Energy Information Bridge

We used in situ X-ray adsorption near-edge structure (XANES) to investigate the formation of chromate conversion coatings on pure Al, commercial Al alloys (AA 1100, AA2024, and AA7075), and a series of binary Al-Cu alloys. The method employed a new electrochemical cell that can determine the ratio of hexavalent chromium (Cr(VI)) to total chromium (Cr(total)) speciation in conversion coatings as a function of exposure time to a chromate solution. The spectra showed that the initial Cr(VI)/Cr(total) ratios are greater than later ones for pure Al and AA1100, but not for AA2024 and AA7075. Measurements with Al-Cu alloys demonstrated that the difference observed in AA2024 and AA7075 may not be due to Cu alloying. The proportion of Cr(VI) in the coatings becomes approximately constant after 180 s of exposure for all the specimens examined even though the coatings continue to grow.

NTIS

Aluminum; Aluminum Alloys; Protective Coatings

20020027690 Colorado School of Mines, Center for Welding Joining and Coatings Research, Golden, CO USA

High Strength Steel Weldment Reliability ***Final Report, 15 Feb. 1998-14 Aug. 2001***

Olson, D. L.; Aug. 2001; 46p; In English

Contract(s)/Grant(s): DAAG55-98-1-0085

Report No.(s): AD-A398550; CSM-MT-CWJCR-001-022; ARO-P-37378.22-MS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The development of methods to control the diffusible hydrogen content during high strength steel welding was performed. The perfection of the use of irreversible weld metal hydrogen traps was demonstrated. Efforts have effectively alleviated the available diffusible hydrogen, and thus the susceptibility of hydrogen assisted cracking, by the use of ferro yttrium additions to the welding consumable. The range of welding parameter for the most effective use of yttrium as a hydrogen getter was determined. The investigation of the influence of retained austenite on cracking susceptibility was also investigated. Issues regarding the amount of acceptable retained austenite and its tendency to release hydrogen upon changes of service temperature and stress were evaluated. The development of an advanced measuring apparatus for diffusible hydrogen content based on electronic, optical1 and magnetic property measurements was investigated. The effort is searching for a rapid and accurate determination for both diffusible hydrogen content and distribution. This investigation used the instrumentation acquired during the DURIP grant program. Optoelectronic property measurements of color shifts in WO3, which was attached to the steel in the form of a thin film detector, have successfully measured the diffusible hydrogen content of higher strength steel hydrogen contents. Preliminary results have also illustrated that both magnetic property and thermo electric (Seebeck) coefficient measurements can also be used to assess hydrogen issues in steel. The Seebeck coefficient appears to offer the most convenient and rapid determinations of diffusible hydrogen content.

DTIC

High Strength Alloys; Welding; High Strength Steels

20020027695 General Electric Co., Nuclear Materials and Propulsion Operation, Cincinnati, OH USA
High-Temperature Materials Program ***Progress Report, 15 Oct.-15 Dec. 1962***
Jan. 25, 1963; 47p; In English
Contract(s)/Grant(s): AT(40-1)-2847
Report No.(s): AD-A398519; GEMP-19A; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report is the unclassified portion of the nineteenth in a series of monthly reports of the work in process on materials development for the Atomic Energy Commission under Contract AT(40-1)2847. Included is a summary of the work from October 15, 1962, to December 15, 1962, on three of the fourteen specific development programs in process. Five of the remaining programs are reported in the classified portion of this report, GEMP-19, Part B. The other six, involving the development of ceramic fuel materials, are reported in alternate months.
DTIC
Refractory Metals; Reactor Materials; Nuclear Electric Power Generation; Ceramics

20020028406 NASA Glenn Research Center, Cleveland, OH USA
Oxidative Recession, Sulfur Release, and Al203 Spallation for Y-Doped Alloys
Smialek, James L., NASA Glenn Research Center, USA; [2001]; 6p; In English
Contract(s)/Grant(s): RTOP 714-04-20; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Second-order spallation phenomena have been noted for Y-doped Rene'N5 after long term oxidation at 1150 degrees C. The reason for this behavior has not been conclusively identified. A mass equivalence analysis has shown that the surface recession resulting from oxidation has the potential of releasing about 0.15 monolayer of sulfur for every 1 mg/sq cm of oxygen reacted for an alloy containing 5 ppmw of sulfur. This amount is significant in comparison to levels that have been shown to result in first-order spallation behavior for undoped alloys. Oxidative recession is therefore speculated to be a contributing source of sulfur and second-order spallation for Y-doped alloys.
Author
Alloys; Doped Crystals; Oxidation; Spallation; Sulfur

20020028884 Joint Publications Research Service, Arlington, VA USA
Soviet Research in Powder Metal Materials
Feb. 28, 1963; 29p; In English
Report No.(s): AD-A398677; JPRS-17887; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This document provides translations of six articles from the Russian language periodical 'Powder Metal Materials and Methods of Investigating Them.' The contents include: (1) Sintering chromium boride; (2) Equipment for determining the kinetics of vaporization and the vapor tension of metal powders; (3) Methods of preparing alloys of titanium carbide with molybdenum; (4) Production of titanium nitride from sponge titanium; (5) A new method of manufacturing rods made of refractory compounds; (6) Production of nitrides of refractory metals.
CASI
Chromium Borides; Metal Powder; Sintering; Titanium

20020029714 Helsinki Univ. of Technology, Lab. of Metallurgy, Espoo, Finland
Seminar Course on Advanced Metallurgical Processes/2000
Kekkonen, M.; Dec. 2000; 40p; In English
Report No.(s): PB2002-102664; TKK-MK-110; Mak-37.145; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The basic aim of the Seminar Course on Advanced Metallurgical Processes is to improve the students' knowledge on the newest progress in metallurgical processes, new technologies and trends of metallurgical industry as well as new alternative approaches to metals production. A holistic view into the process analysis and design is also emphasized. The course comprises of a series of lectures on selected topics e.g. direct reduction, direct smelting, novel refining processes, new progress in non-ferrous metullurgy and applications of plasma technology. The main emphasis, during the last couple of years, has been directed to conduct students to prepare scientific contributions both as written and oral presentations. Accordingly, the students prepare a report on a given topic and give oral contribution in a seminar with discussion and criticism. In order to promote internationalization of metallurgy students a co-operation was started with Royal Institute of Technology (KTH). Stockholm in 1996. As a collaboration from joint student seminars on process metallurgy were decided to be arranged once a year.
NTIS
Metallurgy; Plasmas (Physics); Students

20020029912 Carnegie-Mellon Univ., Pittsburgh, PA USA

Theoretical Minimum Energies to Produce Steel for Selected Conditions

Fruehan, R. J.; Fortini, O.; Paxton, H. W.; Brindle, R.; May 01, 2000; 41p; In English

Report No.(s): DE2001-769470; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The energy used to produce liquid steel in today's integrated and electric are furnace (EAF) facilities is significantly higher than the theoretical minimum energy requirements. This study presents the absolute minimum energy to produce steel ore and mixtures of scrap and scrap alternatives. Additional cases in which the assumptions are changed to more closely approximate actual operating conditions are also analyzed. The results, summarized in Table E-1, should give insight into the theoretical and practical potentials for reducing steelmaking energy requirements. The energy values have also been converted to carbon dioxide (CO2) emissions in order to indicate the potential for reduction in emissions of this greenhouse gas (Table E-2). This study showed that increasing scrap melting has the largest impact on energy consumption. However, scrap should be viewed as having 'invested' energy since at one time it was produced by reducing ore. Increasing scrap melting in the BOF may or may not decrease energy if the 'invested' energy in scrap is considered.

NTIS

Energy Conservation; Steels; Energy Consumption; Energy Requirements; Minerals

20020029913 Energetics, Inc., Columbia, MD USA

Energy use in the U.S. steel industry: a historical perspective and future opportunities

Stubbles, J.; Sep. 01, 2000; 53p; In English

Report No.(s): DE2001-769469; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report focuses on the concept of good practices (i.e., those that are sustainable and can use today's technology). If all the industry could operate on this basis, the additional savings per ton could total 2 Mbtu. As further restructuring occurs and the swing from hot metal-based to electric furnace-based production continues, the average consumption will approach the good practice energy per ton. Further savings will accrue through new technology, particularly in the areas of reduced blast furnace fuel rates and reheating efficiency, both of which relate to large tonnages of material.

NTIS

Energy Consumption; Steels; Heating; Industries

20020029923 Los Alamos National Lab., NM USA

Dislocations in mo5sib2 t2 phase

Field, R.; Cooley, J.; Apr. 01, 2001; 12p; In English

Report No.(s): DE2001-777915; LA-UR-01-2032; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Dislocation structures in a nearly single phase annealed Mo5SiB2 T2 alloy have been investigated by transmission electron microscopy (TEM). The dislocations have been subjected to Burgers vector and trace analyses to determine the slip directions and planes with the aid of image simulations generated using single crystal elastic constants derived from first principles calculations. The experimental results ate compared to predicted slip directions and planes from anisotropic elasticity calculations. Thermal expansion coefficients have been measured by dilatometry and are compared to both calculated and previous experimental values measured using diffraction techniques. Lastly, preliminary compression testing has been performed on the single phase material at 1200 C.

NTIS

Annealing; Elastic Properties; Thermal Expansion; Diffraction

20020030240 Argonne National Lab., IL USA

Near-field photoluminescence spectroscopy of localized states in InGaAsN alloys

Mintairov, A. M.; Blagnov, P. A.; Kosel, T.; Merz, J. L.; Ustinov, V. M.; Dec. 11, 2001; 7p; In English

Report No.(s): DE2001-789740; ANL/MSD/CP-106416; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The authors used near-field magneto-photoluminescence scanning microscopy to study structural and optical properties of quantum-dot-like compositional fluctuations in GaAsN and InGaAsN alloys. We show that these fluctuations manifest themselves by the appearance of narrow emission lines (halfwidth 0.5-2 meV) at temperatures below 70K. We estimated the size, density, and nitrogen excess of individual compositional fluctuations (clusters), revealing phase-separation effects in the

distribution of nitrogen in GaAsN and InGaAsN. We found a dramatic difference in the Zeeman splitting of cluster lines between GaAsN and InGaAsN, indicating a strong effect of In on the exciton g-factor.
NTIS
Photoluminescence; Spectroscopy; Emission Spectra; Near Fields

20020030352 Los Alamos National Lab., NM USA
Ejecta particle size distributions for shock loaded sn and al metals
Sorenson, D. S.; Minich, R. W.; Jun. 01, 2001; 5p; In English
Report No.(s): DE2001-783331; LA-UR-01-3375; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
When a shock wave interacts at the surface of a metal sample 'ejected matter' (ejecta) can be emitted from the surface. The mass, size, shape and velocity of the ejecta varies depending on the initial shock conditions and the material properties of the target. to understand this phenomena, experiments have been conducted at the Pegasus Pulsed Power Facility (PPPF) located at Los Alamos National Laboratory (LANL). The facility is used to implode cylinders to velocities of many mm/usec. The driving cylinder impacts a smaller target cylinder where shock waves of a few hundreds of kilobars can be reached and ejecta formation proceeds. The ejecta particle sizes are measured for shock loaded Sn and Al metal samples using an in-line Fraunhofer holography technique. The distributions will be compared to calculations from 3 and 2 dimensional percolation theory.
NTIS
Metals; Emittance; Size Distribution; Percolation; Holography

20020030359 Los Alamos National Lab., NM USA
Compressive properties of a closed-cell aluminum foam as a function of strain-rate and temperature
Cady, C. M.; Gray, G. T.; Jun. 01, 2001; 5p; In English
Report No.(s): DE2001-783275; LA-UR-01-3149; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The compressive deformation behavior of a closed-cell Aluminum foam (ALPORAS) manufactured by Shinko Wire. Co. in Japan was evaluated under static and dynamic loading conditions as a function of temperature. High strain rate tests (1000-2000/s) were conducted using a split-Hopkinson pressure bar(SHPB). Quasi-static and intermediate strain rate tests were conduced on hydraulic load frame. Little change in the flow stress behavior as a function of strain rate was measured. The deformation behavior of the Al-foam was however found to be strongly temperature dependent under both quasi-static and dynamic loading. Localized deformation and stress state instability during testing of metal foams will be discussed in detail since the behavior over the entire range of strain rates indicates non-uniform deformation.
NTIS
Aluminum; Compressive Strength; Compressibility; Metal Foams

20020030744 NASA Marshall Space Flight Center, Huntsville, AL USA
Time-Temperature-Precipitation Behavior in Al-Li Alloy 2195
Chen, P. S., IIT Research Inst., USA; Bhat, B. N., NASA Marshall Space Flight Center, USA; February 2002; 21p; In English
Report No.(s): NASA/TM-2002-211548; M-1043; NAS 1.15:211548; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Transmission electron microscopy was used to study time-temperature-precipitation (TTP) behavior in aluminum-lithium (Al-Li) 2195 alloy. Al-Li 2195 (nominally Al + 4 percent Cu + 1 percent Li + 0.3 percent Ag + 0.3 percent Mg + 0.1 percent Zr) was initially solutionized for 1 hr at 950 F and then stretched 3 percent. Heat treatments were conducted for up to 100 hr at temperatures ranging from 200 to 1,000 F. TTP diagrams were determined for both matrix and subgrain boundaries. Depending upon heat treatment conditions, precipitate phases (such as GP zone, theta'', theta', theta, delta', T1, TB, and T2) were found in the alloy. The TTP diagrams were applied as a guide to avoid T1 precipitation at subgrain boundaries, as part of an effort to improve the alloy's cryogenic fracture toughness (CFT). New understanding of TTP behavior was instrumental in the development of a two-step artificial aging treatment that significantly enhanced CFT in Al-Li 2195.
Author
Aluminum-Lithium Alloys; Fracture Strength; Heat Treatment; Aging (Metallurgy); Microstructure; Copper Alloys

20020030745 NASA Marshall Space Flight Center, Huntsville, AL USA
Cryogenic Fracture Toughness Improvement for the Super Lightweight Tank's Main Structural Alloy
Chen, P. S., IIT Research Inst., USA; Stanton, W. P., NASA Marshall Space Flight Center, USA; February 2002; 23p; In English
Report No.(s): NASA/TM-2002-211547; M-1042; NAS 1.15:211547; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Marshall Space Flight Center has developed a two-step (TS) artificial aging technique that can significantly enhance cryogenic fracture toughness and resistance to stress corrosion cracking (SCC) in aluminum-copper-lithium alloy 2195. The new TS aging treatment consists of exposures at 132 C (270 F)/20 hr + 138 C (280 F)/42 hr, which can be readily applied to flight hardware production. TS aging achieves the same yield strength levels as conventional aging, while providing much improved ductility in the short transverse direction. After TS aging, five previously rejected lots of alloy 2195 (lots 950M029B, 960M030F, 960M030J, 960M030K, and 960M030L) passed simulated service testing for use in the super lightweight tank program. Each lot exhibited higher fracture toughness at cryogenic temperature than at ambient temperature. Their SCC resistance was also enhanced. All SCC specimens passed the minimum 10-day requirement in 3.5-percent sodium chloride alternate immersion at a stress of 45 ksi. The SCC lives ranged from 57 to 83 days, with an average of 70 days.
Author
Cryogenics; Fracture Strength; Aging (Metallurgy); Mechanical Properties; High Strength Alloys; Stress Corrosion Cracking

20020030761 NASA Marshall Space Flight Center, Huntsville, AL USA
Artificial Aging Effects on Cryogenic Fracture Toughness of the Main Structural Alloy for the Super Lightweight Tank
Chen, P. S., IIT Research Inst., USA; Stanton, W. P., NASA Marshall Space Flight Center, USA; February 2002; 30p; In English
Report No.(s): NASA/TM-2002-211546; M-1041; NAS 1.15:211546; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In 1996, Marshall Space Flight Center developed a multistep heating rate-controlled (MSRC) aging technique that significantly enhanced cryogenic fracture toughness (CFT) and reduced the statistical spread of fracture toughness values in alloy 2195 by controlling the location and size of strengthening precipitate T1. However, it could not be readily applied to flight-related hardware production, primarily because large-scale production furnaces are unable to maintain a heating rate of 0.6 C (1 F)/hr. In August 1996, a new program was initiated to determine whether the MSRC aging treatment could be further modified to facilitate its implementation to flight hardware production. It was successfully redesigned into a simplified two-step aging treatment consisting of 132 C (270 F)/20 hr + 138 C (280 F)/40 hr. Results indicated that two-step aging can achieve the same yield strength levels as those produced by conventional aging while providing greatly improved ductility. Two-step aging proved to be very effective at enhancing CFT, enabling previously rejected materials to meet simulated service requirements. Cryogenic properties are improved by controlling T1 nucleation and growth so that they are promoted in the matrix and suppressed in the subgrain boundaries.
Author
Fracture Strength; Aging (Metallurgy); Heat Treatment; Precipitation Hardening; Aluminum-Lithium Alloys; Copper Alloys

20020031244 NASA Glenn Research Center, Cleveland, OH USA
Effect of Impact Damage on the Fatigue Response of TiAl Alloy-ABB-2
Draper, S. L., NASA Glenn Research Center, USA; Lerch, B. A., NASA Glenn Research Center, USA; Pereira, J. M., NASA Glenn Research Center, USA; Nathal, M. V., NASA Glenn Research Center, USA; Nazmy, M. Y., ALSTOM Power Ltd., Switzerland; Staubli, M., ALSTOM Power Ltd., Switzerland; Clemens, D. R., Howmet Research Corp., USA; [2001]; 8p; In English; Third International Symposium on Structural Intermetallics, 23-27 Sep. 2001, Jackson Hole, WY, USA; Sponsored by Minerals, Metals and Materials Society, USA
Contract(s)/Grant(s): RTOP 708-24-13; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The ability of gamma-TiAl to withstand potential foreign or domestic object damage is a technical risk to the implementation of gamma-TiAl in low pressure turbine (LPT) blade applications. In the present study, the impact resistance of TiAl alloy ABB-2 was determined and compared to the impact resistance of Ti(48)Al(2)Nb(2)Cr. Specimens were impacted with four different impact conditions with impact energies ranging from 0.22 to 6.09 J. After impacting, the impact damage was characterized by crack lengths on both the front and backside of the impact. Due to the flat nature of gamma-TiAl's S-N (stress vs. cycles to failure) curve, step fatigue tests were used to determine the fatigue strength after impacting. Impact damage increased with increasing impact energy and led to a reduction in the fatigue strength of the alloy. For similar crack lengths, the fatigue strength of impacted ABB-2 was similar to the fatigue strength of impacted Ti(48)Al(2)Nb(2)Cr, even though the tensile properties of the two alloys are significantly different. Similar to Ti(48)Al(2)Nb(2)Cr, ABB-2 showed a classical mean stress dependence on fatigue strength. The fatigue strength of impacted ABB-2 could be accurately predicted using a threshold analysis.
Author
Impact Damage; Impact Resistance; Turbine Blades; Titanium Aluminides; Fatigue (Materials)

20020032327 California Univ., Lawrence Radiation Lab., Berkeley, CA USA

Prediction of High Temperature Metallic Phase Diagrams

Brewer, Leo; Jul. 1963; 103p; In English

Contract(s)/Grant(s): W-7405-ENG-48

Report No.(s): AD-A398762; UCRL-10701; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Engel correlation between electronic configurations and crystal structures of metallic phases is confirmed and applied to the binary and multicomponent systems of the thirty metals of the three transition series from the alkali metals to the nickel-platinum group. The use of the Engel correlation to obtain electron configurations cad the application of internal pressures of the metals to the regular solution theory together with consideration of the sizes of metal atoms rakes possible the prediction of unknown phase diagrams. Diagrams are given as projections upon a composition scale and composition ranges given are the maximum extent over the entire temperature range of the solid phases. of the two billion possible muiticomponent phase diagrams of the thirty metals, at least one and a half billion are readily obtained from the figures, tables, and text and methods are described for extending the procedures for prediction of phase diagrams to additional diagrams outside the range of metals considered.
DTIC

Phase Diagrams; Internal Pressure; Alkali Metals

20020032333 New York Univ., New York, NY USA

Correlation of Plate Creep Buckling Theory with Experiments on Long Plates of Aluminum Alloy 2024-0 at 500 degree F

Papirno, Ralph; Gerard, George; Sep. 1962; 41p; In English

Contract(s)/Grant(s): AF-33(657)-8233

Report No.(s): AD-A398798; TASD-TDR-62-865; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The results of creep-buckling experiments on long, simply-supported plates of aluminum alloy 2024-0 at 500 F under axial compression were correlated with a previously developed theory for perfect plates. Corn pressive-creep properties of the test material were obtained to develop the theoretical results. The plate experiments were performed using a square-tube configuration after an evaluation program indicated that the conventional vee groove-knife edge arrangement for simulating simple support was unsatisfactory for use at elevated temperatures. The theory was found to have predictive value for plate creep buckling when used in normalized form. A simplified approach for predicting creep crippling was also correlated with the test data.
DTIC

Aluminum Alloys; Creep Properties; High Temperature; Plate Theory; Creep Buckling

20020032615 NASA Glenn Research Center, Cleveland, OH USA

Mechanical Testing of IN718 Lattice Block Structures

Krause, David L., NASA Glenn Research Center, USA; Whittenberger, John D., NASA Glenn Research Center, USA; Kantzos, Pete T., Ohio Aerospace Inst., USA; Hebsur, Mohan G., Ohio Aerospace Inst., USA; [2002]; 9p; In English; Processing and Properties of Lightweight Cellular Metals and Structures: TMS Third Global Symposium, 17-21 Feb. 2002, Seattle, WA, USA

Contract(s)/Grant(s): RTOP 714-04-50; Copyright; Avail: Issuing Activity

Lattice block construction produces a flat, structurally rigid panel composed of thin ligaments of material arranged in a three-dimensional triangulated truss-like structure. Low-cost methods of producing cast metallic lattice block panels are now available that greatly expand opportunities for using this unique material system in today's high-performance structures. Additional advances are being made in NASA's Ultra Efficient Engine Technology (UEET) program to extend the lattice block concept to superalloy materials. Advantages offered by this combination include high strength, light weight, high stiffness, and elevated temperature capabilities. Recently under UEET, the nickel-based superalloy Inconel 718 (IN718) was investment cast into lattice block panels with great success. to evaluate casting quality and lattice block architecture merit, individual ligaments and structural subelement specimens were extracted from the panels. Tensile tests and structural compression and bending strength tests were performed on these specimens. Fatigue testing was also completed for several bend test specimens. This paper first presents metallurgical and optical microscopy analysis of the castings. This is followed by mechanical test results for the tensile ligament tests and the subelement compression and bending strength tests, as well as for the fatigue tests that were performed. These tests generally showed comparable properties to base IN718 with the same heat treatment, and they underscored the benefits offered by lattice block materials. These benefits might be extended with improved architecture such as face sheets.
Author

Fatigue Tests; Panels; Tensile Tests; Dynamic Structural Analysis; Heat Resistant Alloys

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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.

20020027285 Brookhaven National Lab., Upton, NY USA
Color Glass Condensate
McLerran,; Aug. 26, 2001; 16p; In English
Report No.(s): DE2001-789444; BNL-68751; No Copyright; Avail: Department of Energy Information Bridge
The Color Glass Condensate is a state of high density gluonic matter which controls the high energy limit of hadronic interactions. Its properties are important for the initial conditions for matter produced at the Relativistic Heavy Ion Collider.
NTIS
Color; Condensates; Glass; Quantum Chromodynamics

20020027468 Oak Ridge National Lab., TN USA
High temperature surface measurements using lifetime imaging of thermographic phosphors: bonding tests
Allison, S. W.; Oct. 29, 2001; 6p; In English
Report No.(s): DE2001-788699; P01-112315; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Temperature-sensitive paint (TSP) comprised of thermally sensitive phosphor can provide a viable means for noncontact thermometry in wind tunnel and other aeropropulsion applications. Described here are recent results aimed at developing a phosphor and binder system that will cover a wide temperature range, ambient to 1000 C. The phosphor/binder mixture is to be sprayed directly on the surface with an airbrush. Whereas many surfaces are candidates for various uses, the present effort concerned silicon carbide, silicon nitride and silica substrates. Initial tests show that a phosphor mixture with two water-soluble materials, designated LK and HPC and manufactured by ZYP Inc., adhered well to these substrate. This same material was earlier shown to function well on a high strength nickel alloy.
NTIS
Thermography; Binders (Materials); Phosphors; Coatings

20020027549 Akron Univ., Inst. of Polymer Science, Akron, OH USA
Tackifier Interfacial Segregation in Pressure Sensitive Adhesives ***Final Report***
Foster, Mark D.; Paiva-Ramirez, Adriana; Mar. 01, 2000; 26p; In English
Contract(s)/Grant(s): DAAH04-95-1-0562
Report No.(s): AD-A398316; ARO-34588.6-MS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The aim is to precisely characterize the tackifier distribution in model pressure sensitive adhesives and correlate variations in this distribution with the adhesives properties. Work focused on investigating the mechanical properties of the model adhesives near the surface, following the aging of a phase separated model adhesive, and synthesizing and isolating a new model tackifier which is closer in structure to common commercial tackifiers derived from wood rosin. Probing of the surface mechanical properties was done on two scales. Force-distance measurements done with a spherical indenter probed the behavior averaged over lateral areas on the order of millimeters and to depths of order microns. Force-distance measurements done with an atomic force microscope were able to resolve differences in the behavior of various domains in a phase segregated model adhesive and to limit the depth with which the mechanical properties were probed to less than one aim. In the phase segregated model adhesive a viscoelastic behavior was seen in the tackifier enriched domains, an intermediate behavior in the domain interfaces, and a viscous response in the matrix. The tackifier enriched phase appears to contribute primarily to the surface adhesion. AFM images and force-distance curves were collected for model adhesives of various compositions and after aging for 3.5, 7, 10, and 12 months.
DTIC
Adhesives; Mechanical Properties

20020027675 NASA Ames Research Center, Moffett Field, CA USA
On the Calculation of Anisotropic Extinction Coefficients for Rigid Fibrous Ceramic Insulations
Marshall, Jochen, NASA Marshall Space Flight Center, USA; Milos, Frank, NASA Marshall Space Flight Center, USA; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only
The specific anisotropic extinction coefficient e* couples the effective Radiative properties of a fibrous insulation into the radiation diffusion equation. This coefficient can be calculated using Mie scattering theory if fiber diameters, refractive indices

and fiber orientation distributions are known. In general, fiber orientation distributions are not readily accessible and past calculations have considered fibers as either randomly distributed or normal to the heat flow direction. In certain rigid fibrous ceramic insulations neither of these cases apply well and a simple procedure is described for approximating e* from values calculated for the random and normal orientation cases. The intrinsic error associated with this scaling procedure is investigated. Numerical computations for several test structures and fiber materials show the average error to be less than 5% for net heat flux and radiation conductivity calculations.
Author
Anisotropy; Ceramics; Insulation; Fiber Orientation; Rigid Structures

20020027989 National Inst. of Standards and Technology, Gaithersburg, MD USA
NIST Recommended Practice Guide: The Use of Nomenclature in Dispersion Science and Technology
Hackley, V. A.; Ferraris, C. F.; Aug. 2001; 76p
Report No.(s): PB2001-102890; NIST/SP-960-3; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The need for broadly accepted, uniform and precise nomenclature was acknowledged recently by the Ceramic Processing Characterization Consortium (CPCC), a voluntary cooperative organization with participants representing industry, instrument companies, academia and government. A principal goal of the consortium was to develop guidelines and recommended practices for the implementation of process measurements. CPCC members identified nomenclature as a high priority issue in the areas of dispersion and dispersion rheology. As a result, work was initiated on two nonmenclature guides, which were ultimately distributed as NIST Special Publications 945 and 946. The present document is essentially a compilation, with updates, of these two previous publications, and provides guidelines for the use of technical and scientific nomenclature relevant to ceramic dispersions.
NTIS
Particulates; Rheology; Dispersion; Research and Development; Ceramics

20020028003 National Renewable Energy Lab., Golden, CO USA
New Continuous Isosorbide Production from Sorbitol: Office of Industrial Technologies (OIT) Agriculture Project Fact Sheet
Carde, T.; Sep. 12, 2001; 2p; In English
Report No.(s): DE2001-789070; DOE/GO-102001-1461; NREL/FS-810-30907; No Copyright; Avail: Department of Energy Information Bridge
Isosorbide is a new polymer additive derived from corn (via sorbitol) that when copolymerized with polyethylene terephthalate (PET), increases the strength and rigidity of the plastic. This project will develop an economically-viable, continuous catalytic process to convert sorbitol to isosorbide.
NTIS
Polyethylene Terephthalate; Polymer Chemistry; Additives

20020028386 Edgewood Chemical Biological Center, Aberdeen Proving Ground, MD USA
Experimental Procedures for the Measurement of Polymer Solubility and Rheological Properties ***Final Report***
Shuely, Wendel J.; Ince, Brian S.; Nov. 2001; 29p; In English
Contract(s)/Grant(s): PR-622384/ACB2
Report No.(s): AD-A398675; ECBC-TR-091; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The rheological evaluation of viscoelastic polymer solutions is important in characterizing two-phase flow, aerodynamic breakup, dynamic contact angle and spreading behavior, and adhesive transfer of solutions between surfaces. The preparation and property measurement of polymer solutions is an important aspect of several of these investigations and rather than report these methods separately, the development of these techniques is documented in this methodology report. The experimental procedures and calibration techniques developed for rheological research provided reliable, standardized methodology for investigation of the viscoelastic behavior of polymer solutions.
DTIC
Polymer Chemistry; Viscoelasticity; Rheology; Solubility

20020028397 NASA Ames Research Center, Moffett Field, CA USA

Ceramic Thermal Protection Technology From The Space Shuttle to Access to Space

Goldstein, Howard E., NASA Ames Research Center, USA; [1995]; 1p; In English; University of Texas-Pan American Conference, 30 Mar. 1995, Edinburg, TX, USA; Sponsored by Texas Univ., USA

Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

The presentation will describe the Space Shuttle Orbiter Thermal Protection System. Ceramic materials technology developed for the Shuttle an improvements introduced after its early flights will be delineated. The current Thermal Protection Technology state of the art and future needs for low cost access to space will be discussed.

Author

Ceramics; Spacecraft Shielding; Thermal Protection

20020028933 ATK-Thiokol Propulsion, Brigham City, UT USA

Materials Compatibility Testing in RSRM ODC: Free Cleaner Selection

Keen, Jill M., ATK-Thiokol Propulsion, USA; Sagers, Neil W., ATK-Thiokol Propulsion, USA; [2001]; 7p; In English; 37th AIAA/ASME/SAE/ASEE Joint Propulsion Conference and Exhibit, 8-11 Jul. 2001, Salt Lake City, UT, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAS8-38100

Report No.(s): AIAA Paper 2002-6098; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Government regulations have mandated production phase-outs of a number of solvents, including 1,1,1-trichloroethane, an ozone-depleting chemical (ODC). This solvent was used extensively in the production of the Reusable Solid Rocket Motors (RSRMs) for the Space Shuttle. Many tests have been performed to identify replacement cleaners. One major area of concern in the selection of a new cleaner has been compatibility. Some specific areas considered included cleaner compatibility with non-metallic surfaces, painted surfaces, support materials such as gloves and wipers as well as corrosive properties of the cleaners on the alloys used on these motors. The intent of this paper is to summarize the test logic, methodology, and results acquired from testing the many cleaner and material combinations.

Author

Cleaners; Compatibility; Solvents; Corrosion Tests

20020029292 Sandia National Labs., Albuquerque, NM USA

Molecular Self-Assembly

Curro, J. G.; McCoy, J. D.; Frischknecht, A. L.; Yu, K.; Nov. 01, 2001; 25p; In English

Report No.(s): DE2001-789581; SAND2001-3417; No Copyright; Avail: Department of Energy Information Bridge

This report is divided into two parts: a study of the glass transition in confined geometries, and formation mechanisms of block copolymer mesophases by solvent evaporation-induced self-assembly. The effect of geometrical confinement on the glass transition of polymers is a very important consideration for applications of polymers in nanotechnology applications. We hypothesize that the shift of the glass transition temperature of polymers in confined geometries can be attributed to the inhomogeneous density profile of the liquid. Accordingly, we assume that the glass temperature in the inhomogeneous state can be approximated by the Tg of a corresponding homogeneous, bulk polymer, but at a density equal to the average density of the inhomogeneous system. Simple models based on this hypothesis give results that are in remarkable agreement with experimental measurements of the glass transition of confined liquids. Evaporation-induced self-assembly (EISA) of block copolymers is a versatile process for producing novel, nanostructured materials and is the focus of much of the experimental work at Sandia in the Brinker group. In the EISA process, as the solvent preferentially evaporates from a cast film, two possible scenarios can occur: microphase separation or micellization of the block copolymers in solution. In the present investigation, we established the conditions that dictate which scenario takes place. Our approach makes use of scaling arguments to determine whether the overlap concentration occurs before or after the critical micelle concentration (CMC). These theoretical arguments are used to interpret recent experimental results of Yu and collaborators on EISA experiments on Silica/PS-PEO systems.

NTIS

Self Assembly; Block Copolymers; Ceramic Matrix Composites; Nanotechnology

20020029619 Analytic Services and Materials, Inc., Hampton, VA USA

Influence of Crack-Tip Configurations on the Fracture Response of 0.04-Inch Thick 2024-T3 Aluminum Alloy Sheet

Johnston, William M., Analytic Services and Materials, Inc., USA; February 2002; 24p; In English

Contract(s)/Grant(s): NAS1-96014; RTOP 706-61-11-03

Report No.(s): NASA/CR-2002-211442; NAS 1.26:211442; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of fracture tests were conducted on Middle-crack tension M(T) and compact tension C(T) specimens to determine the effects of specimen type, specimen width, notch tip sharpness and buckling on the fracture behavior of cracked thin sheet (0.04 inch thick) 2024-T3 aluminum alloy material. A series of M(T) specimens were tested with three notch tip configurations: (1) a fatigue pre-cracked notch, (2) a 0.010-inch-diameter wire electrical discharge machined (EDM) notch, and (3) a EDM notch sharpened with a razor blade. The test procedures are discussed and the experimental results for failure stress, load vs. crack extension and the material stress-strain response are reported.

Author

Crack Propagation; Aluminum Alloys; Crack Tips; Fracture Mechanics

20020029911 Department of the Navy, Washington, DC USA

Method for Increasing Fracture Toughness and Reducing Brittleness of Ferroelectric Polymer

Ramotowski, Thomas S., Inventor; Jul. 30, 2001; 16p; In English

Patent Info.: Filed 30 Jul. 2001; US-Patent-Appl-SN-09922309

Report No.(s): AD-D019991; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

No abstract available.

Author

Brittleness; Fracture Strength; Fracture Mechanics; Ferroelectric Materials

20020030204 NASA Langley Research Center, Hampton, VA USA

Macro Fiber Piezocomposite Actuator Poling Study

Werlink, Rudy J., NASA Langley Research Center, USA; Bryant, Robert G., NASA Langley Research Center, USA; Manos, Dennis, College of William and Mary, USA; February 2002; 27p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 706-32-31

Report No.(s): NASA/TM-2002-211434; L-18151; NAS 1.15:211434; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The performance and advantages of Piezocomposite Actuators are to provide a low cost, in-situ actuator/sensor that is flexible, low profile and high strain per volt performance in the same plane of poled voltage. This paper extends reported data for the performance of these Macrofiber Composite (MFC) Actuators to include 4 progressively narrower Intedigitized electrode configurations with several line widths and spacing ratios. Data is reported for max free strain, average strain per applied volt, poling (alignment of the electric dipoles of the PZT ceramic) voltage vs. strain and capacitance, time to poling voltage 95% saturation. The output strain per volt progressively increases as electrode spacing decreases, with saturation occurring at lower poling voltages. The narrowest spacing ratio becomes prone to voltage breakdown or short circuits limiting the spacing width with current fabrication methods. The capacitance generally increases with increasing poling voltage level but has high sensitivity to factors such as temperature, moisture and time from poling which limit its usefulness as a simple indicator. The total time of applied poling voltage to saturate or fully line up the dipoles in the piezoceramic was generally on the order of 5-20 seconds. Less sensitivity to poling due to the applied rate of voltage increase over a 25 to 500 volt/second rate range was observed.

Author

Actuators; Piezoelectric Ceramics; Fiber Composites; Fabrication; Electric Potential

20020030233 Argonne National Lab., IL USA

Calcium oxide coating on vanadium alloys in liquid lithium

Park, J. H.; Natesan, K.; Smith, D. L.; Nov. 16, 2001; 6p; In English

Report No.(s): DE2001-789734; ANL/ET/CP-106232; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We have fabricated CaO coatings on vanadium metal and various vanadium alloys (V-10Cr, V-1Ti, V-4Cr-4Ti, and V-5Cr-5Ti), for use in liquid metal blankets of fusion reactors. Initially, by monitoring weight change as a function of time, oxygen was charged into the vanadium alloys (rectangular sample, 2x1x0.1 cm) at 710degC by flowing Ar-O2 gas. Oxygen-charged samples were exposed in 2.8 at.% Ca-Li at temperatures of 600 and 700degC for times between 50 and 120 h. The thickness of the in-situ-formed CaO was 13 to 30 um in the experimental conditions. Thicker CaO films were formed at higher oxygen contents

and 700degC, while thinner CaO films were formed at lower oxygen contents and 600degC. The data show promise for in-situ formation of CaO layers on V alloys for the fusion blanket application.
NTIS
Calcium Oxides; Vanadium; Vanadium Alloys; Gas Flow; Liquid Metals

20020030355 Los Alamos National Lab., NM USA
Proposed atlas liner design fabricated for hydrodynamics experiments on shiva star
Anderson, W.; Adams, C.; Jun. 01, 2001; 5p; In English
Report No.(s): DE2001-783255; LA-UR-01-3225; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An entirely new cylindrical liner system has been designed and fabricated for use on the Shiva Star capacitor bank. The design incorporates features expected to be applicable to a future power flow channel of the Atlas capacitor bank with the intention of keeping any required liner design modifications to a minimum when the power flow channel at Atlas is available. Four shots were successfully conducted at Shiva Star that continued a series of hydrodynamics physics experiments started on the Los Alamos Pegasus capacitor bank. Departures from the diagnostic suite that had previously been used at Pegasus required new techniques in the fabrication of the experiment insert package. We describe new fabrication procedures that were developed by the Polymers and Coatings Group (MST-7) of the Los Alamos Materials Science Division to fabricate the Shiva Star experiment loads. Continuing MST-7 development of interference fit processes for liner experiment applications, current joints at the glide planes were assembled by thermal shrink fit using liquid nitrogen as a coolant (1). The liner material was low strength, high conductance 1100 series aluminum. The liner glide plane electrodes were machined from full hard copper rod with a 10 ramp to maintain liner to glide plane contact as the liner was imploded. The parts were fabricated with 0.015 mm radial interference fit between the liner inside diameter (ID) and the glide plane outside diameter (OD) to form the static liner current joints. The liner was assembled with some axial clearance at each end to allow slippage if any axial force was generated as the liner assembly cassette was bolted into Shiva Star, a precaution to guard against buckling the liner during installation of the load cassette. Other unique or unusual processes were developed and are described. Minor adaptations of the liner design are now being fabricated for first Atlas experiments.
NTIS
Hydrodynamics; Linings; Cylindrical Bodies; Aluminum

20020032322 University of Southern California, Los Angeles, CA USA
Materials and Processing at the Nanometer Scale ***Final Report, 1 Jun. 1996-31 May 2001***
Dalton, Larry R.; Nov. 19, 2001; 51p; In English
Contract(s)/Grant(s): F49620-96-1-0035; Proj-3484
Report No.(s): AD-A398739; AFRL-SR-BL-TR-02-0011; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Researchers supported by the DoD MURI on Materials & Processing at the Nanometer Scale (administered by AFOSR) have pioneered the use of nanoscale 'dendrimers' or 'tree-like branched molecular structures with each limb designed for a special function' to achieve electronic isolation and directed energy/ charge transport. These novel dendrimer materials have been used to develop improved electro-optic modulator materials, light harvesting and optical amplifier materials, high-density electronic memory materials, light emitting diode materials, and two-photon lasing materials. Incorporation of electro-optic organic chromophore into the core of dendrimer materials eliminates quenching of macroscopic electro-optic activity by intermolecular (chromophore) electrostatic interactions. Other advances involving nanoscale materials include the first demonstration (with Allied Signal Corporation and later Honeywell) of single wall carbon nanotube actuators. Polymer nanospheres have been used to demonstrate high-density erasable optical memories and nanoscale chemical reactors crucial for improving the efficiency of fuel cells. Polymer microspheres have also been used as templates for chemical synthesis and such chemical machining has been used to achieve visible wavelength photonic bandgap materials. Advances have been made in the fabricating of phase-separating block copolymers. Inorganic/organic nanocomposites have been used to fabricate high-density optical memories (including holographic and two-photon memories), organic lasers, and sensor protection materials.
DTIC
Block Copolymers; Chromophores; Molecular Structure; Molecular Interactions; Nanocomposites

28
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.

20020027358 Office of Oil and Gas, Washington, DC USA
Natural gas imports and exports ***Quarterly Report, Fourth Quarter, 1999***
Mar. 01, 2000; 164p; In English
Report No.(s): DE2001-770918; DOE/FE-0414; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Office of Natural Gas; Petroleum Import; Export Activities prepares quarterly reports showing natural gas import and export activity. Companies are required to file quarterly reports. Attachments show the percentage of takes to maximum firm contract levels and the weighted average per unit price for each of the long-term importers during the five most recent quarters, volumes and prices of gas purchased by long-term importers and exporters during the past 12 months, volume and price data for gas imported on a short-term or spot market basis, and the gas exported on a short-term or spot market basis to Canada and Mexico.
NTIS
Natural Gas; International Trade

20020028006 National Renewable Energy Lab., Golden, CO USA
Biofuels News, Volume 4
Tuttle, J.; Jul. 13, 2001; 3p; In English
Report No.(s): DE2001-789060; DOE/GO-102001-1371; NREL/BR-580-30215; No Copyright; Avail: Department of Energy Information Bridge

Newsletter for the DOE (Department of Energy) biofuels program. This issue contains articles on the National Energy Policy Plan, national energy policy, the proposed budget for biofuels, and new faces at DOE.
NTIS
Ethyl Alcohol; Biomass Energy Production

20020028056 Illinois Univ., Dept. of Mechanical Engineering, Chicago, IL USA
The Burning of Large N-Heptane Droplets in Microgravity
Manzello, Samuel L., Illinois Univ., USA; Choi, Mun Young, Illinois Univ., USA; Kazakov, Andrei, Princeton Univ., USA; Dryer, Frederick L., Princeton Univ., USA; Dobashi, Ritsu, Tokyo Univ., Japan; Hirano, Toshisuke, Tokyo Univ., Japan; [2000]; 26p; In English; 28th International Symposium on Combustion, 2 Aug. 2000, Edinburgh, Scotland, UK; Sponsored by Illinois Univ., USA
Contract(s)/Grant(s): NCC3-655; RTOP 101-32-0D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Experimental results are presented on the burning and sooting behavior of large n-heptane droplets in air at atmospheric pressure under microgravity conditions. The experiments were performed at the Japanese Microgravity Center (JAMIC) 10 sec dropshaft in Hokkaido, Japan. Soot volume fraction, burning rate, flame standoff and luminosity were measured for droplets of 2.6 mm and 2.9 mm in initial diameter. These are the largest droplets for which soot volume fraction measurements have ever been performed. Previous measurements of soot volume fractions for n-heptane droplets, confined to smaller droplet sizes of less than 1.8 mm, indicated that maximum soot volume fraction increased monotonically with initial droplet size. The new results demonstrate for the first time that sooting tendency is reduced for large droplets as it has been speculated previously but never confirmed experimentally. The lower soot volume fractions for the larger droplets were also accompanied by higher burning rates. The observed phenomenon is believed to be caused by the dimensional influence on radiative heat losses from the flame. Numerical calculations confirm that soot radiation affects the droplet burning behavior.
Author
Burning Rate; Heptanes; Nitrogen; Microgravity; Combustion; Data Acquisition; Soot

20020028360 Virginia Univ., Center for Transportation Studies, Charlottesville, VA USA
Assessment of Advanced Engine Technology for the University of Virginia Transit System ***Final Report***
Lamb, J.; Espino, R.; Oct. 2000; 36p; In English
Report No.(s): PB2002-102246; UVA/29472/CE01/101; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report discusses the possibility of using an alternative engine and fuel technology for a transit system utilizing the University of Virginia's new Groundswalk route. This alternative technology can replace the conventional diesel engine and prove

superior in specified characteristics deemed important for use in the University Transit Service. The conclusions reached in this study are applicable to a conventional bus design and for minibus and other multi-passenger vehicles operating off a track. The conventional diesel bus in the mainstay of the transit industry and the alternative technologies discussed in this report are those that have proven or have the potential to be viable replacements. The following is a list of the technologies considered in this report: Electric Buses, Hybrid Electric Diesel Buses, Fuel Cell Buses, and Natural Gas Buses (Liquefied Natural Gas and Compressed Natural Gas).
NTIS
Diesel Engines; Transportation; Natural Gas; Technology Utilization

20020029285 National Energy Technology Lab., Pittsburgh, PA USA
New solid fuels from coal and biomass waste
Farzan, H.; Sep. 24, 2001; 68p; In English
Report No.(s): DE2001-789505; AC26-99FT40158-01; No Copyright; Avail: Department of Energy Information Bridge
In response to DOE's 'Solid Fuels and Feedstocks Grand Challenge,' McDermott Technology, Inc. (MTI), (the R&D affiliate of B&W), and Minergy Corporation developed a project evaluate sludge derived fuel (SDF) produced from sewage sludge. Our approach is to dry and agglomerate the sludge, combine it with a fluxing agent, if necessary, and coal, and burn the resulting fuel in the cyclone boiler to recover the energy and to vitrify mineral matter into a non-leachable product. This product can then be used in the construction industry. As a result of this program, wastes that are currently not being used and considered an environmental problem will be processed into a renewable fuel. These fuels will be converted to energy while reducing CO2 emissions from power generating boilers and mitigating global warming concerns. Phase I of the project consisted of the laboratory scale development and testing of the technology. Phase II was intended to be for the proof-of-concept testing of the technology, however, MTI elected not to pursue funding. This report covers all Phase I activities.
NTIS
Biomass; Coal; Construction Industry; Carbon Dioxide

20020029624 Los Alamos National Lab., NM USA
Granular explosives and initiation sensitivity
Menikoff, R.; Nov. 01, 1999; 23p; In English
Report No.(s): DE2001-787244; LA-UR-99-6023; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Fundamental chemical reaction rates are temperature depend. However, the initiation process for a heterogeneous explosive is dominated by peaks in the temperature field called hot spots. Numerical simulations typically use empirical pressure dependent reaction rates. These can be viewed as a subgrid model that accounts for unresolved reaction phenomenon. The limitation of simple burn rates is most severe for the initiation of a detonation wave by a weak stimuli. The problem is particularly acute for accident scenarios that involved damaged explosives. A granular explosive captures the dominant features of damage; a heterogeneous length scale for the grain size and an additional degree of freedom from porosity. Continuum mechanical simulations on the meso-scale are used to better understand how the hot-spot distribution varies with mechanical stimuli, in particular, the strength of a compaction wave in a granular bed. A physical understanding of the formation and growth of hot spots is needed to develop improved subgrid burn models that encompass a wider domain of applicability.
NTIS
Explosives; Grain Size; Detonation Waves; Chemical Reactions

20020029862 Washington Univ., School of Pharmacy, Seattle, WA USA
Reproductive and Offspring Developmental Effects Following Maternal Inhalation Exposure to Methanol in Nonhuman Primates, *1990 - 1998*
Burbacher, T.; Grant, K.; Sheppard, L.; Damian, D.; Ellis, S.; Oct. 1999; 150p; In English
Report No.(s): PB2002-102300; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
To investigate the reproductive and developmental toxicity of inhaled methanol vapor, adult female Macaca fascicularis monkeys were exposed to 0, 200, 600, or 1,800 ppm methanol vapor for 2 hours/day, every day, prior to (for 180 days on average) and during pregnancy, until birth. Resultant blood methanol concentrations were 2 to 10 times background endogenous levels. Thirty-four liveborn infants and two stillborn, one in the control group and one in the 600 ppm-exposure group, were delivered. One fetus died in the 1,800 ppm-exposure group. Lvie-birth and stillborn infants had on obvious birth defects. Five liveborn infants exposed to methanol were delivered via Cesarean section because of complications at delivery; four of these required oxygen therapy. The average length of gestation of methanol-exposed infants (-160 days) was significantly shorter than that of controls (-168 days). Prenatal methanol exposure did not affect offspring size at birth, or various behavioral characteristics and

assessments. Exposure was associated with ratings of 'low arousal' on the Neonatal Assessment scale, changes in visual recognition memory, and a delay in early sensorimotor development (for male infants). Finally, prenatal methanol exposure was associated with a severe wasting syndrome in female offspring after approximately one year of age. Because this is the first report of an association between low-level methanol exposure and offspring developmental effects, further investigations are needed to confirm these findings.
NTIS
Toxicity; Respiration; Methyl Alcohol

20020029914 Department of Energy, Office of Fossil Energy, Germantown, MD USA
Clean Coal Technology Demonstration Program: Project fact sheets 2000, status as of June 30, 2000
Sep. 01, 2000; 197p; In English
Report No.(s): DE2001-769382; DOE/FE-0419; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Clean Coal Technology Demonstration Program (CCT Program), a model of government and industry cooperation, responds to the Department of Energy's (DOE) mission to foster a secure and reliable energy system that is environmentally and economically sustainable. The CCT Program represents an investment of over $5.2 billion in advanced coal-based technology, with industry and state governments providing an unprecedented 66 percent of the funding. With 26 of the 38 active projects having completed operations, the CCT Program has yielded clean coal technologies (CCTs) that are capable of meeting existing and emerging environmental regulations and competing in a deregulated electric power marketplace. The CCT Program is providing a portfolio of technologies that will assure that U.S. recoverable coal reserves of 274 billion tons can continue to supply the nation's energy needs economically and in an environmentally sound manner. As the nation embarks on a new millennium, many of the clean coal technologies have realized commercial application. Industry stands ready to respond to the energy and environmental demands of the 21st century, both domestically and internationally. For existing power plants, there are cost-effective environmental control devices to control sulfur dioxide (SO2), nitrogen oxides (Nox), and particulate matter (PM). Also ready is a new generation of technologies that can produce electricity and other commodities, such as stream and synthetic gas, and provide efficiencies and environmental performance responsive to global climate change concerns.
NTIS
Coal; Environmental Control; Particulates; Regulations; Climate Change; Control Equipment

20020029916 University of Central Florida, Orlando, FL USA
Solar Photocatalytic Hydrogen Production from Water Using a Dual Bed Photosystem. Phase I, Final Report and Phase II Proposal
Linkous, C. A.; Slattery, D. K.; Sep. 11, 2000; 43p; In English
Report No.(s): DE2001-771058A; DOE/GO/10449; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The objective of the Phase II effort is to perform R&D tasks will enable engineering and economic analysis of the technology. Our preliminary determination, based on materials costs, is that dual bed could produce H2 at $13/mBtu if the solar-to-H2 energy conversion efficiency of the system is 8%. Accordingly, we propose to perform a system analysis of several dual bed configurations (series-connected, tandem membrane, and perforated membrane) to evaluate whether these alternative configurations would accrue efficiency improvements. We will also include the effect of using a redox conformer as mediator, to ascertain the effect of utilizing a more complex mediator whose reversibility is a function of molecular conformation. Now that we have a good idea about what molecular structures make the best photocatalysts, we will design, synthesize, and test a number of compounds that would appear to have optimum characteristics. Pending favorable results on the aforementioned activities, we will construct square foot-sized modules and test them under solar simulated conditions. Support is also requested to be able to attend and participate in experts meetings associated with Annex 14 of the International Energy Agency on Photoelectrolytic Production of Hydrogen.
NTIS
Water; Hydrogen Production; Solar Energy Conversion; Molecular Structure; Oxidation-Reduction Reactions; Systems Analysis

20020029917 Institute of Gas Technology, Des Plaines, IL USA
Production of Hydrogen by Superadiabatic Decomposition of Hydrogen Sulfide. Final Technical Report for the Period June 1, 1999-September 30, 2000 ***Final Report, 1 Jun. 1999 - 30 Sep. 2000***
Slimane, R. B.; Lau, F. S.; Abbasian, J.; Oct. 01, 2000; 155p; In English
Report No.(s): DE2001-771057A; DOE/GO/10450-F; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this program is to develop an economical progress for hydrogen production, with no additional carbon dioxide emission, through the thermal decomposition of hydrogen sulfide (H2S) in H2S-rich waste streams to high-purity hydrogen and elemental sulfur. The novel feature of the process being developed is the superadiabatic combustion (SAC) of part of the H2S in the waste stream to provide the thermal energy required for the decomposition reaction such that no additional energy is required. The program is divided into two phases. In Phase 1, detailed thermochemical and kinetic modeling of the SAC reactor with H2S-rich fuel gas and air/enriched air feeds is undertaken to evaluate the effects of operating conditions on exit gas products and conversion efficiency, and to identify key process parameters. Preliminary modeling results are used as a basis to conduct a thorough evaluation of SAC process design options, including reactor configuration, operating conditions, and product/by-product separation schemes, with respect to potential product yields, thermal efficiency, capital and operating costs, and reliability, ultimately leading to the preparation of a design package and cost estimate for a bench-scale reactor testing system to be assembled and tested in Phase 2 of the program. A detailed parametric testing plan was also developed for process design optimization and model verification in Phase 2. During Phase 2 of this program, IGT, UIC, and industry advisors UOP and BP Amoco will validate the SAC concept through construction of the bench-scale unit and parametric testing. The computer model developed in Phase 2 will be updated with the experimental data and used in future scale-up efforts. The process design will be refined and the cost estimate updated. Market survey and assessment will continue so that a commercial demonstration project can be identified.

NTIS

Hydrogen Production; Pyrolysis; Energy Conversion Efficiency; Design Optimization; Design Analysis; Hydrogen Sulfide

20020029918 Florida Solar Energy Center, Cape Canaveral, FL USA

Thermocatalytic CO2-Free Production of Hydrogen from Hydrocarbon Fuels ***Final Report, Aug. 1999 - Sep. 2000***

Muradov, N.; Oct. 01, 2000; 66p; In English

Report No.(s): DE2001-771056; DOE/GO/10456; No Copyright; Avail: Department of Energy Information Bridge

The overall objective of this work is to develop a novel process for CO2-free production of hydrogen via thermocatalytic decomposition (pyrolysis) of hydrocarbon fuels as a viable alternative to the conventional processes of methane steam reforming or partial oxidation. The objective pf Phase I work was to demonstrate the technical feasibility of CO2-free production of hydrogen and carbon from different hydrocarbons, including methane, propane and gasoline.

NTIS

Carbon Dioxide; Pyrolysis; Hydrocarbon Fuels; Hydrogen Production; Hydrogen Fuels; Oxidation

20020029926 Los Alamos National Lab., NM USA

Influence of polymer molecular weight, temperature, and strain rate on the mechanical properties of pbx 9501

Idar, D. J.; Thompson, D. G.; Jun. 01, 2001; 5p; In English

Report No.(s): DE2001-783223; LA-UR-01-3461; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Compression and tensile measurements were conducted on newly formulated (baseline) and lower molecular weight (virtually-aged) plastic explosive PBX 9501. The PBX 9501 binder system is composed of nitroplasticized Estane 5703, TM a polyester polyurethane copolymer. The molecular weight of polyester urethanes can degrade with time as a function of hydrolysis, affecting the mechanical behavior of the polymer or a polymer composite material of high explosives, i.e. PBXs. The molecular weight of Estance 5703 TM was degraded by exposure to high temperature and humidity of different periods of time, and then formulated to produce 'virtually-aged' PBX 9501 specimens. Quasi-static and dynamic compression tests were conduced on the baseline and virtually-aged PBX 9501 as a function of temperature and strain rate. Quasi-static tensile tests were also conduced as a function of temperature and test rate. Rate and temperature dependence was exhibited during both compression and tensile loading. Results also show significant differences between the baseline and virtually-aged specimens for the dynamic compression tests at -15 C, and for the quasi-static compression tests at -15 C, 22 C, and 50 C.

NTIS

Polymers; Molecular Weight; Composite Materials; Copolymers; Dynamic Tests; Hydrolysis

20020030081 Los Alamos National Lab., NM USA

Five to ten ma experiments using flat plate explosive generators

Goforth, J. H.; Caird, R. S.; Jun. 01, 2001; 5p; In English

Report No.(s): DE2001-783306; LA-UR-01-3172; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

High explosive pulsed power (HEPP) techniques can address a wide range of pulsed power needs. The basis for HEPP techniques is the use of high explosives to reduce the inductance of a current-carrying circuit, thus multiplying the current due to magnetic flux conservation. For the past twenty years at Los Alamos, our high energy density physics (HEDP) program has

followed a path leading to more sophisticated and higher current (and often power) systems. Twenty years ago, we had the capability of conducting tests at 10, or even 30 MA, with no power conditioning and low inductance loads. The time scale of the experiment was the time it took to compress the flux explosively, and our fastest generator with high current capability was a plate generator (1). The operating time of the generator is less than 15 us, and flux loading requires either an additional -60 us or a reduced-efficiency inductive coupling scheme. We could also deliver shortened pulses to select loads by completing our generator circuit, initially, with a relatively high inductance circuit element, then switching in a lower inductance with 2-3 us left of the generator pulse. Figure 1 shows the results of such a test. The test was conducted in 1974 to investigate our capability to drive plasma z-pinch experiments for the production of soft x-rays (2), and was a pulsed power success. However, our understanding of vacuum power flow issues was not mature enough at that time to design a functioning plasma z-pinch load.
NTIS
Explosives; Quantum Mechanics; Pulse Generators; Flux Density; High Current

20020030100 Argonne National Lab., IL USA
Designing for hydrogen, electricity, and CO2 recovery from a Shell gasification based system
Doctor, R. D.; Molburg, J. C.; Brockmeier, N. F.; Stiegel, G. J.; Oct. 26, 2001; 15p; In English
Report No.(s): DE2001-789725; ANL/ES/CP-106097; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The U.S. Department of Energy (DOE) is investigating CO2 recovery from fossil-fuel cycles as a greenhouse gas mitigation strategy. Recognizing this, we compared two integrated gasification combined-cycle (IGCC) plant designs based on the Shell entrained-flow gasifier. One option, called the 'co-product case,' uses high-sulfur Illinois no. 6 coal to produce electricity and hydrogen (H2) as energy carriers. At the same time, 90% of the carbon dioxide (CO2) is recovered for disposal in geological storage or for use, such as in enhanced-oil recovery (EOR). The second option called the 'base case,' is a conventional IGCC power plant releasing CO2 by combustion of the synthesis gas in a gas turbine. Process design has been aided by the use of the ASPEN-Plus (trademark) simulation for critical design areas. Special attention is paid to the transport issues for the CO2 product, because transportation technology is a determinant of product specifications, which affect plant design. Separating and purifying the H2 for fuel cell use should yield an impressive gain in overall process efficiency, offsetting the losses in efficiency from recover and compression of CO2 to supercritical conditions.
NTIS
Coal; Gasification; Carbon Dioxide; Hydrogen

20020030836 Army Tank-Automotive and Armaments Command, Warren, MI USA
R&D for Fuel Economy in Automotive Propulsion
Jun. 19, 1972; 131p; In English
Report No.(s): AD-A398716; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report is submitted to the Chairman, Transportation Energy Panel sponsored by the Department of Transportation for the Office of Science and Technology. Presentations and views on assigned topics and concepts are sorted, discussed, evaluated, ranked, and examined for benefits in energy savings. Candidate concepts with the best energy saving benefit potentials are rated with respect to time and cost. Conclusions are drawn; recommendations are offered.
DTIC
Automobiles; Energy Conservation; Propulsion; Transportation Energy; Fuel Consumption

20020031784 Eastern Research Group, Inc., Lexington, MA USA
Summary of Workshop on Biodegradation of MTBE, February 1-3, 2000
Feb. 2000; 50p; In English
Report No.(s): PB2002-102850; No Copyright; Avail: National Technical Information Service (NTIS)

A workshop on biodegradation of methyl tert-butyl ether (MTBE)-contaminated soils and groundwater was held in Cincinnati, OH, on February 1-3, 2000, and was sponsored by the U.S. Environmental Protection Agency's (EPA) National Risk Management Research Laboratory (NRMRL) and the American Petroleum Institute (API). Researchers in academia, industry, and government agencies were invited to attend and present current research. The goals of the workshop were: to gain an understanding of the types of MTBE research that various organizations are conducting and of the conclusions that this research is generating, to identify the remaining research needs on MTBE biodegradability, and to understand what research is being planned for the future and to identify potential opportunities for collaboration.
NTIS
Biodegradation; Ethers; Contamination; Methyl Compounds

20020032317 Pennsylvania State Univ., University Park, PA USA
Fuel Formulation Studies ***Final Report, 1 Nov. 1997-15 Jan. 2000***
Arnold, B.; Badger, Mark; Miller, Bruce; Song, Chunshan; May 2000; 135p; In English; Original contains color images
Contract(s)/Grant(s): F33615-98-D-2802; Proj-3048
Report No.(s): AD-A398712; AFRL-PR-WP-TR-2000-2121; No Copyright; Avail: Defense Technical Information Center (DTIC)

Studies of industrial methods of producing coal-derived jet fuels were undertaken. The focus of the effort was on incorporating coal or coal components into the existing petroleum refinery infrastructure.
DTIC
Coal; Crude Oil; Jet Engine Fuels

20020033027 Pennsylvania State Univ., Dept. of Mechanical and Nuclear Engineering, University Park, PA USA
Fuel Degradation and Allied Studies Delivery Order 5 ***Final Report, 1 Jun. 1998-31 Jul. 2001***
Boehman, Andre; Eser, Semih; Hatcher, Pat; Miller, Bruce; Schobert, Harold; Song, Chunshan; Jul. 2000; 102p; In English
Contract(s)/Grant(s): F33615-98-D-2802; AF Proj. 3048
Report No.(s): AD-A398558; AFRL-PR-WP-TR-2000-2120; No Copyright; Avail: Defense Technical Information Center (DTIC)

Experimental and theoretical efforts were undertaken to further the understanding of the thermal degradation of coal-derived and petroleum-derived jet fuels. Thermal degradation includes both thermal-oxidative and pyrolytic degradation and deposition.
DTIC
Jet Engine Fuels; Thermal Degradation

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.

20020028402 NASA Glenn Research Center, Cleveland, OH USA
Anisotropic Colloidal Self-Assembly
Gast, Alice P., Stanford Univ., USA; Furst, Eric M., Delaware Univ., USA; Agui, Juan H., NASA Glenn Research Center, USA; Lewis, Michael J., NASA Glenn Research Center, USA; [2001]; 7p; In English; Conference on International Space Station Utilization, 15-18 Oct. 2001, Cocoa Beach, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAG3-2398; RTOP 101-13-0B
Report No.(s): AIAA Paper 2001-5091; Copyright Waived; Avail: Issuing Activity

An experimental plan to study the dynamics of field induced aggregation and rheological properties of paramagnetic colloids under long duration microgravity conditions is presented. In this study an external magnetic field induces dipolar interactions between paramagnetic particles in a magnetorheological (MR) fluid. The fundamental structure of these dipolar interactions is a chain of particles constrained in the direction of the field but exhibiting lateral fluctuations due to thermal motion. More resilient and complex aggregate structures are formed from the cross-linking of chains and coalescence of multiple chains (or columns) at large concentrations.
Author
Anisotropy; Colloids; Magnetorheological Fluids; Self Assembly; Microgravity

20020028405 NASA Glenn Research Center, Cleveland, OH USA
Numerical Study of g-Jitter Induced Double-Diffusive Convection
Shu, Y., Washington State Univ., USA; Li, B. Q., Washington State Univ., USA; deGroh, Henry C., NASA Glenn Research Center, USA; Numerical Heat Transfer, Part A; 2001; ISSN 1040-7782; Volume 39, pp. 245-265; In English
Contract(s)/Grant(s): NCC8-92; NAG8-1693; RTOP 101-15-30; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A finite element study is presented of double-diffusive convection driven by g-jitter in a microgravity environment. Mathematical formulations are presented and extensive simulations are carried out for g-jitter induced fluid flow, temperature distribution, and solutal transport in an alloy system under consideration for space flights. Computations include the use of idealized single-frequency and multi-frequency g-jitter as well as the real g-jitter data taken during an actual Space Shuttle fight.

Little correlation is seen between these velocity components for the g-jitter components studied. The temperature field is basically undisturbed by convection because of a small Pr number for the fluid. The disturbance of the concentration field, however, is pronounced, and the local variation of the concentration follows the velocity oscillation in time. It is found that although the concentration field varies in both position and time, the local concentration gradient remains approximately constant in time. Numerical study further indicates that with an increase in g-jitter force (or amplitude), the nonlinear convective effects become much more obvious, which in turn drastically change the concentration fields. The simulated results computed using the g-jitter data taken during space flights show that both the velocity and concentration become random, following approximately the same pattern as the g-jitter perturbations.
Author
Finite Element Method; Convection; Diffusivity; Microgravity; Vibration; Alloys

20020029723 NASA Glenn Research Center, Cleveland, OH USA
Passive and Active Stabilization of Liquid Bridges in Low Gravity
Marston, Philip L., Washington State Univ., USA; Thiessen, David B., Washington State Univ., USA; Marr-Lyon, Mark J., Washington State Univ., USA; Wei, Wei, Washington State Univ., USA; Niederhaus, Charles E., NASA Glenn Research Center, USA; Truong, Duc K., NASA Glenn Research Center, USA; [2001]; 7p; In English; International Space Station Utilization, 15-18 Oct. 2001, Kennedy Space Center, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAG3-2378; RTOP 101-43-0A
Report No.(s): AIAA Paper 2001-5093; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Tests are planned in the low gravity environment of the International Space Station (ISS) of new methods for the suppression of the capillary instability of liquid bridges. Our suppression methods are unusual in that they are not limited to liquid bridges having very special properties and may impact a variety of low-gravity and earth-based technologies. There are two main approaches to be investigated: (1) Passive Acoustic Stabilization (PAS); and (2) Active Electrostatic Stabilization (AES). In PAS, the suppression of the mode growth is accomplished by placing the bridge in an acoustic field having the appropriate properties such that the acoustic radiation pressure automatically pulls outward on the thinnest portion of the bridge. In AES, the bridge deformation is sensed optically and counteracted by actively adjusting the electrostatic Maxwell stresses via two ring electrodes concentric with the slightly conducting bridge to offset the growth of the unstable mode. While the present work emphasizes cylindrical bridges, the methods need not be restricted to that case. The methods to be explored are relevant to the suppression of capillary instabilities in floating zone crystal growth, breakup of liquid jets and columns, bubbles, and annular films as well as the management of coolants or propellants in low-gravity.
Author
Liquid Bridges; Microgravity; Sound Fields; Stabilization; Cylindrical Bodies

20020032299 NASA Glenn Research Center, Cleveland, OH USA
Physics of Colloids in Space-2 (PCS-2)
Sankaran, Subramanian, National Center for Microgravity Research on Fluids and Combusiton, USA; Gasser, Urs, Harvard Univ., USA; Manley, Suliana, Harvard Univ., USA; Valentine, Megan, Harvard Univ., USA; Prasad, Vikram, Harvard Univ., USA; Rudhardt, Daniel, Harvard Univ., USA; Bailey, Arthur, Harvard Univ., USA; Dinsmore, Anthony, Harvard Univ., USA; Segre, Phil, NASA Marshall Space Flight Center, USA; Doherty, Michael P., NASA Glenn Research Center, USA; [2001]; 18p; In English; AIAA ISS Utilization Conference, 15-18 Oct. 2001, Cocoa Beach, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NAG3-2284; RTOP 101-13-0B
Report No.(s): AIAA Paper 2001-4959; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Physics of Colloids-2 (PCS-2) experiment is aimed at investigating the basic physical properties of several types of colloidal suspensions. The three broad classes of colloidal systems of interest are binary colloids, colloid-polymer mixtures, and fractal gels. The objective is to understand their phase behavior as well as the kinetics of the phase transitions in the absence of gravity. The nucleation, growth, and morphology characteristics of the crystals and gels that form would be studied using confocal microscopy. These will be observed directly with excellent time resolution, and therefore extensive information about the different phases and their growth mechanisms will be gained. With the laser tweezers, it will be possible to measure the strength of these structures and to modify them in a controlled way, and the spectrophotometer will provide the possibility to probe their optical properties. We believe that this experiment will provide the basis for future 'colloid engineering' in which complicated structures with novel properties (e.g., photonic crystals) will be grown by controlled self-assembly.
Author
Colloids; Phase Transformations; Kinetics; Morphology

20020032308 NASA Glenn Research Center, Cleveland, OH USA

Microgravity Acceleration Environment of the International Space Station (Panel)

DeLombard, Richard, NASA Glenn Research Center, USA; Hrovat, Kenneth, ZIN Technologies, Inc., USA; Kelly, Eric, ZIN Technologies, Inc., USA; McPherson, Kevin, NASA Glenn Research Center, USA; Foster, William M., NASA Glenn Research Center, USA; Schafer, Craig P., Science Applications International Corp., USA; [2001]; 18p; In English; AIAA Conference and Exhibit on International Space Station Utilization 2001, 15-18 Oct. 2001, Cape Canaveral, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NAS3-99154

Report No.(s): AIAA Paper 2001-5115; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper examines the microgravity environment provided to the early science experiments by the International Space Station vehicle which is under construction. The microgravity environment will be compared with predicted levels for this stage of assembly. Included are initial analyses of the environment and preliminary identification of some sources of accelerations. Features of the operations of the accelerometer instruments, the data processing system, and data dissemination to users are also described.

Author

International Space Station; Microgravity; Accelerometers; Data Processing Equipment

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.

20020027352 NASA Ames Research Center, Moffett Field, CA USA

Performance Testing of a Lightweight, High Efficiency 95 K Cryocooler

Salerno, Lou, NASA Ames Research Center, USA; Kittel, P., NASA Ames Research Center, USA; Kashani, A., Atlas Scientific, USA; Helvensteijn, B. P. M., Atlas Scientific, USA; Tward, E., TRW, Inc., USA; [2001]; 1p; In English; Nineteenth International Cryogenic Engineering Conference, 22-26 Jul. 2002, Grenoble, France; No Copyright; Avail: Issuing Activity; Abstract Only

Performance data are presented for a flight-like, lightweight, high efficiency pulse tube cryogenic cooler. The cooler has a mass of less than 4.0 kg, and an efficiency of 12 W/W, which is 18% of Carnot at 95 K, nearly double the efficiency of previous cooler designs, The mass of the cooler has been reduced by approximately a factor of three. The design point cooling power is 10 watts at 95 K at a heat rejection temperature of 300 K. The no-load temperature is 45 K. The compressor is built by Hymatic Engineering, UK, and is of a horizontally opposed piston design using flexure bearings. The vertical pulse tube is built by TRW with the heat exchanger or cold block located approximately mid-way along the tube. The final assembly and integration is also performed by TRW. The inertance tube and dead volume are contained within one of the compressor end caps. The cooler was developed by TRW under a joint NASA-DOD program, and has a goal of 10 yr operating lifetime. Potential NASA applications will focus on using coolers of this type in Zero boil off (ZBO) cryogen storage topologies for next generation launch vehicles. Zero boil off systems will feature significant reductions in tank size and Initial Mass to Low Earth Orbit (IMLEO), thereby significantly reducing the cost of access to space, and enabling future missions. The coolers can be used directly in liquid oxygen (LOx) or liquid methane ZBO systems, as shield coolers in liquid hydrogen tanks, or as first stage coolers in two-stage liquid hydrogen (LH2) ZBO cooler systems. Finally, the coolers could find applications in exploration missions where either propellants or breathable oxygen are extracted from the planetary atmosphere using a Sabatier or similar process. The gases could then be liquefied for storage either directly in return vehicle propellant tanks or on the planetary surface. Data presented were taken with the cooler operating in a vacuum of 10 (exp -5) torr, at controlled rejection temperatures from 300 K down to 275 K using a cold water heat exchanger bolted to the cooler. Heat loads were varied between 0.5 W and 15 W by supplying current to a 50 omega resistor mounted on a copper cold plate which was bolted to the cooler cold block. Silicon diodes mounted on both the cold plate and the heat exchanger provided accurate temperature measurement to within plus or minus 0.25 K and plus or minus 0.5 K respectively, up to 100 K with plus or minus 1% accuracy above 100 K. Input power to the compressor was limited to 180 W, corresponding to a maximum stroke of 80%.

Author

Cryogenic Cooling; Performance Tests; Planetary Atmospheres; Cooling Systems

20020027993 National Inst. of Standards and Technology, Gaithersburg, MD USA

Weights and Measures Directory. 2000 Edition

Sebring, L. T.; Jan. 2002; 216p; In English

Report No.(s): PB2002-102288; NISTIR-6500; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This directory is a compilation of persons and organizations associated with the profession of weights and measures. It contains four lists: (1) State weights and measures directors; (2) weight and measures staff under each jurisdiction; (3) State personnel involved in petroleum testing; and (4) Federal contacts. A list of NIST Office of Weights and Measures staff is included in the directory as well as a table showing their specific areas of responsibility. Additionally, this directory contains Internet Web Sites relevant to weights and measures activities.

NTIS

Weight Measurement; Metrology; Directories; Internets

20020027994 National Inst. of Standards and Technology, Gaithersburg, MD USA

Analysis of Dimensional Metrology Standards

Evans, J.; Frechette, S.; Hurst, J.; Huang, H.; Kramer, T.; Dec. 19, 2001; 86p; In English

Report No.(s): PB2002-102287; NISTIR-6847; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This paper is an analysis of documentary standards related to dimensional metrology information, with recommendations regarding standards development. The analysis focuses on the degree to which existing standards and standards under development provide a complete set of non-overlapping specifications for information needed to perform automated dimensional metrology. The analysis was prepared in the Manufacturing Engineering Laboratory at the National Institute of Standards and Technology (NIST). The intent of the analysis is to assist users, vendors, and standards developers in the area of dimensional metrology. This analysis was presented at a meeting on metrology automation in May, 2001 and reflects the situation at that time. As of December, 2001, some progress has been made towards realizing the recommendations made here, but the situation is not radically different.

NTIS

Dimensional Measurement; Metrology; Manufacturing

20020027996 National Inst. of Standards and Technology, Gaithersburg, MD USA

Final Report of the 'e-SRM Committee' on the Optimal Delivery of Services to Customers for Standard Reference Materials

Bruce, S. S.; Clarke, D. J.; Ehrstein, J. R.; Epstein, M. S.; Friend, D. G.; Jun. 2001; 20p; In English

Report No.(s): PB2002-102518; NISTIR-6759; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The e-SRM committee was formed at the request of Technology Services (TS) to recommend way to employ appropriate technologies to optimize the consistency, efficiency, and effectiveness with which NIST provides technical support to customers for Standard Reference Materials (SRMs). The committee included representatives from Technology Services as well as from most of the technical divisions that provide for the certification of SRMs. Input was invited from virtually every staff member involved in the production of SRMs via an e-mail survey and/or circulation of a draft report for comment. Having gathered and organized the most frequent customer inquiries, the committee identified eleven areas of technical opportunity to address the needs expressed in those inquiries. The overriding concern of the committee is to improve customer satisfaction by means of seamless access to desired information, assistance, or suggestion/complaint registration without having prior knowledge of NIST or its organizational structure.

NTIS

Certification; Consistency

20020028001 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Performance assessment and adoption processes of an information monitoring and diagnostic system prototype

Piette, M. A.; Oct. 01, 1999; 67p; In English

Report No.(s): DE2001-789104; LBNL-44453; CD-429; No Copyright; Avail: Department of Energy Information Bridge

This report addresses the problem that buildings do not perform as well as anticipated during design. We partnered with an innovative building operator to evaluate a prototype Information Monitoring and Diagnostic System (IMDS). The IMDS consists of high-quality measurements archived each minute, a data visualization tool, and a web-based capability. The operators recommend similar technology be adopted in other buildings. The IMDS has been used to identify and correct a series of control problems. It has also allowed the operators to make more effective use of the building control system, freeing up time to take care of other tenant needs. They believe they have significantly improved building comfort, potentially improving tenant health, and

productivity. The reduction in hours to operate the building are worth about $20,000 per year, which could pay for the IMDS in about five years. A control system retrofit based on findings from the IMDS is expected to reduce energy use by 20 percent over the next year, worth over $30,000 per year. The main conclusion of the model-based chiller fault detection work is that steady-state models can be used as reference models to monitor chiller operation and detect faults. The ability of the IMDS to measure cooling load and chiller power to one-percent accuracy with a one-minute sampling interval permits detection of additional faults. Evolutionary programming techniques were also evaluated, showing promise in the detection of patterns in building data. We also evaluated two technology adoption processes, radical and routine. In routine adoption, managers enhance features of existing products that are already well understood. In radical adoption, innovative building managers introduce novel technology into their organizations without using the rigorous payback criteria used in routine innovations.
NTIS
Buildings; Cooling Systems; Fault Detection; Scientific Visualization

20020028152 Aristotle Univ. of Thessaloniki, Hellenic Society of Theoretical and Applied Mechanics, Greece
6th National Congress of Mechanics: Book of Abstracts
Aifantis, E. C., Editor; Kounadis, A. N., Editor; Jul. 21, 2001; 252p; In English; 6th National Congress of Mechanics, 19-21 Jul. 2001, Thessaloniki, Greece
Report No.(s): AD-A398650; No Copyright; Avail: CASI; A03, Microfiche; A12, Hardcopy; Abstracts Only; Abstracts Only
It was an honor that HSTAM (Hellenic Society of Theoretical and Applied Mechanics) assigned to the Laboratory of Mechanics of the General Department of AUT the responsibility of organizing the 6th National Congress of Mechanics in cooperation with the Department of Civil Engineering of AUT. The abstracts of this meeting are presented.
DTIC
Abstracts; Mechanics (Physics); Structural Engineering; Conferences; Aerodynamic Characteristics; Computational Fluid Dynamics

20020028153 Aristotle Univ. of Thessaloniki, Hellenic Society of Theoretical and Applied Mechanics, Greece
6th National Congress of Mechanics: Proceedings, Volume 2
Aifantis, E. C., Editor; Kounadis, A. N., Editor; Jul. 21, 2001; 426p; In English; 6th National Congress of Mechanics, 19-21 Jul. 2001, Thessaloniki, Greece
Report No.(s): AD-A398651; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche
It was an honor that HSTAM (Hellenic Society of Theoretical and Applied Mechanics) assigned to the Laboratory of Mechanics of the General Department of AUT the responsibility of organizing the 6th National Congress of Mechanics in cooperation with the Department of Civil Engineering of AUT. The proceedings of this meeting is presented.
DTIC
Conferences; Mechanics (Physics); Structural Engineering; Elastic Properties; Fracture Mechanics; Computational Fluid Dynamics

20020028154 Aristotle Univ. of Thessaloniki, Hellenic Society of Theoretical and Applied Mechanics, Greece
6th National Congress of Mechanics: Proceedings, Volume 3
Aifantis, E. C., Editor; Kounadis, A. N., Editor; Jul. 21, 2001; 165p; In English; 6th National Congress of Mechanic, 19-21 Jul. 2001, Thessaloniki, Greece
Report No.(s): AD-A398652; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
It was an honor that HSTAM (Hellenic Society of Theoretical and Applied Mechanics) assigned to the Laboratory of Mechanics of the General Department of AUT the responsibility of organizing the 6th National Congress of Mechanics in cooperation with the Department of Civil Engineering of AUT. The proceedings of this meeting is presented.
DTIC
Conferences; Mechanics (Physics); Structural Engineering; Composite Structures

20020028163 Aristotle Univ. of Thessaloniki, Hellenic Society of Theoretical and Applied Mechanics, Greece
6th National Congress of Mechanics: Proceedings, Volume 1
Aifantis, E. C., Editor; Kounadis, A. N., Editor; Jul. 21, 2001; 444p; In English; 6th National Congress of Mechanics, 19-21 Jul. 2001, Thessaloniki, Greece
Report No.(s): AD-A398649; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

It was an honor that HSTAM (Hellenic Society of Theoretical and Applied Mechanics) assigned to the Laboratory of Mechanics of the General Department of AUT the responsibility of organizing the 6th National Congress of Mechanics in cooperation with the Department of Civil Engineering of AUT. The proceedings of this meeting is presented.
DTIC
Conferences; Mechanics (Physics); Structural Engineering; Aerodynamic Characteristics; Computational Fluid Dynamics

20020029712 Helsinki Univ. of Technology, Lab. of Chemical Engineering, Espoo, Finland
Inherent Safety and Process Design a Literature Study: Plant Design Series
Martina, C.; Cziner, K.; Hurme, M.; 2001; 58p; In English
Report No.(s): PB2002-102579; PLANT-DESIGN-SER-67; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The aim of process design is to create a process that is profitable, economic, safe, environmentally benign and user friendly. This is achieved by the optimization of process alternatives according to economic and functional criteria. It is required that the safety of a process plant fulfills a certain level and because of general requirements, company image and also economic reasons: in fact an unsafe plant cannot be profitable, due to losses of production and capital. The safety of a chemical process can be achieved through internal (inherent) and external means. The inherent safety is related to the intrinsic properties of the inherent safety to remove hazards rather than to control them by added-on protective systems, that is the principle of external safety. The largest payoffs are achieved by verifying that inherent safety has been considered early and often in the process and engineering design.
NTIS
Chemical Reactions; Product Development; Plant Design; Alternatives

20020029719 Netherlands Energy Research Foundation, Petten, Netherlands
Novel News on the Extraction of Energy from Wind: Heat Generation and Terrain Concentration
Corten, G. P.; Sep. 2001; 10p; In English
Report No.(s): PB2002-103005; ECN-RX-01-054; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
First it will be shown that an actuator disk operating in wind turbine mode extracts more energy from the fluid than can be transferred into useful energy. At the Lanchester-Betz limit the decrease of the kinetic energy in the wind is converted by 2/3 into useful power and by 1/3 into heat. Behind the wind turbine the outer flow and the flow that has passed the actuator disk will mix. In this process momentum is conserved but part of the kinetic energy will dissipate in heat via viscous shear. Second, we will explain that the classic site calibration in complex terrain has no physical basis. The concentration will depend on the wind direction and this implies that a turbine (pitch- or stall-regulated) is expected to have multiple power levels depending on the wind direction under such circumstances. These multiple power levels are expected in particular below rated wind speed. This analysis is put forward in appendix A.
NTIS
Wind Turbines; Actuator Disks; Wind Velocity; Wind Direction; Momentum; Extraction

20020029840 Netherlands Energy Research Foundation, Petten, Netherlands
Experience with Solar Home Systems in Developing Countries
Nieuwenhout, F. D. J.; vanDijk, A. L.; Lasschuit, P. E.; vanRoekel, G. M.; vanDijk, V. A. P.; Jan. 2002; 24p; In English
Report No.(s): PB2002-103010; ECN-RX-02-001; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Solar energy is widely perceived as a promising technology for electricity generation in remote locations in developing countries. It is established that 1.3 million solar home systems had been installed by early 2000. An estimated one-third of installed systems were backed by foreign donor support in government programs and two-thirds supplied by commercial dealers. The estimated growth in the deployment of solar lanterns is less than for SHS. One out of every 100 households that gain access to electricity in developing countries uses solar power. In spite of these successes, doubts have arisen about the effectiveness and suitability of small PV systems for rural development. Many organisational, financial, and technical problems appear to present difficulties. A literature survey has been conducted to make an inventory of experience with solar PV applications for households in developing countries. The main finding is that an adequate service infrastructure is required to make projects viable.
NTIS
Solar Energy; Solar Houses; Surveys

20020030279 Air Command and Staff Coll., Maxwell AFB, AL USA

Modeling and Simulation in Support of Testing and Evaluation

Hodge, Tony F.; Mar. 1997; 39p; In English; Original contains color images

Report No.(s): AD-A397905; AU/ACSC/0574/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

Testing and Evaluating are key to the successful development of an acquisition program. Operational Testing during the development phases of the acquisition process is the most difficult to accomplish. This is so because it requires that a system be nearly complete before you can conduct testing. Computer Modeling and Simulation of a proposed program is one way to achieve early operational test requirements. In this project, I will show how modeling and simulations support test and evaluation. At the conclusion of this paper, I will have given the reader the following: 1) an explanation of how similar programs can benefit from modeling and simulation, 2) an explanation of the current methods of validating models, 3) a discussion on why we should standardize validation methods, and 4) an explanation of how to standardize validation methods.

DTIC

Computerized Simulation; Program Verification (Computers); Mathematical Models

20020030281 Naval Research Lab., Washington, DC USA

NRL Fact Book

Jun. 1999; 136p; In English; Original contains color images

Report No.(s): AD-A398275; No Copyright; Avail: Defense Technical Information Center (DTIC)

The NRL Fact Book is prepared every two years as a reference source for information about the Naval Research Laboratory (NRL). to provide additional information to the reader, a point of contact is listed for each activity.

DTIC

Research and Development; Navy; Documents

20020030282 Naval Research Lab., Washington, DC USA

2001 NRL Review

Bultman, John D.; Jan. 2001; 254p; In English; Original contains color images

Report No.(s): AD-A398271; No Copyright; Avail: Defense Technical Information Center (DTIC)

Today, when government and science seem inextricably linked, when virtually no one questions the dependence of national defense on the excellence of national technical capabilities, it is noteworthy that in-house defense research is relatively new in our Nation’s history. The Naval Research Laboratory (NRL), the first modern research institution created within the USA Navy, began operations in 1923.

DTIC

Defense Program; Navy; Research and Development

20020031748 Air Command and Staff Coll., Maxwell AFB, AL USA

Air Force Development Test and Evaluation Under Acquisition Reform: Six Flight Test Process Concepts

Erno, JoAnn L.; Apr. 1998; 58p; In English

Report No.(s): AD-A398581; No Copyright; Avail: Defense Technical Information Center (DTIC)

Acquisition Reform changed government involvement in system acquisition with transition to best commercial practices. Shortened acquisition timelines, reduced budgets and increased contractor test responsibilities intensified several issues. These issues are test planning and execution capabilities, joint contractor and government test efficiency, and both government and industry test experience levels. Today’s DT&E (Development, Test, and Evaluation) methods are insufficient to successfully overcome increased system complexity, decreased test budgets, and reduced manpower challenges of the future. to meet these challenges, this project presents six test recommendations which enhance DT&E contributions to the acquisition process. The six recommendations are: (1) Develop a single commercial industry standard governing military aviation testing. (2) Emphasize greater simulation configuration control and technological simulation advances, with software test and avionics integration simulation the highest priorities. (3) Refine the Integrated Test Team Concept to combine contractor, development, and operational test requirements in addition to innovative test program teaming. (4) Streamline development and operational test data requirements and allow contractor and development test personnel to supplement operational test teams. (5) Automate test planning and execution functions to reduce manpower investments. (6) Modify the Federal Aviation Administration Designated Engineering Representative concept to increase contractor test autonomy.

DTIC

Armed Forces (USA); Operations Research; Government Procurement; Government/Industry Relations

20020031777 National Inst. of Standards and Technology, (BFRL), Gaithersburg, MD USA

Application of Natural Ventilation for U.S. Commercial Buildings Climate Suitability Design Strategies and Methods Modeling Studies

Axley, J. W.; Dec. 2001; 172p; In English

Report No.(s): PB2002-102520; NIST/GCR-01/820; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Natural ventilation systems have long been employed in European residences to control indoor air quality. Increasingly, European building designers have turned to natural ventilation to control air quality and cool commercial and institutional buildings as well, hoping to take advantage of the potential of natural ventilation systems to conserve energy associated with mechanical cooling and fan operation. Encouraged by early successes of the past decade, European building designers have advanced natural ventilation and technology, introduced promising hybrid ventilation technologies that combine mechanical and natural means, and developed analytical tools for the design of these systems. These systems may be adapted to the North American context, but much work will need to be done to realize the full potential ventilation may offer to North America. This report reviews the application of natural ventilation to commercial buildings, the potential advantages these systems offer, and some of the pitfalls that must be considered. An approach to the analysis of climate suitability is presented and applied to a number of North American climates.

NTIS

Ventilation; Buildings; Air Quality; Cooling

20020031983 Alternative Energy Corp., Raleigh, NC USA

Air of Importance: A Study of Air Distribution Systems in Manufactured Homes

Conlin, F.; Davis, B.; Tyson, J.; Gu, L.; Anello, M.; May 1996; 128p; In English

Report No.(s): PB2002-103352; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

One has only to look at the statistics to see how important it is to consider manufactured housing in any residential energy research. Twenty percent of existing single-family homes in the USA are manufactured, and 25 percent of new single-family homes built last year were factory-built. In North Carolina, the leading state for manufactured-home shipments, 40 percent of new homes last year were manufactured. Sponsored residential energy research has advanced the understanding of building systems in general, but this research is not always transferable from site-built to factory-built housing. The scarcity of articles in the literature dealing with new manufactured homes demonstrates the disproportionate level of research investment being spent in this burgeoning home construction approach. The small amount of manufactured housing research that does exist has recently focused mainly on ways to improve the thermal envelope. This led, in part, to an increase in the thermal requirements for manufactured homes in the recent changes to the HUD Standards (October, 1994). In the last several years, building scientists across the country have been quantifying the contribution made by air distribution systems to building efficiency loss in site-built homes. Estimates vary, but the average duct system appears to reduce overall system efficiency by 20 to 40 percent. This efficiency loss can have a multiplying effect with air-flow sensitive, compressor-based space conditioning systems such as air conditioners and heat pumps. Meanwhile, air distribution systems in new manufactured homes have received very little attention. This study is a step forward in trying to better understand air distribution in manufactured homes and their affect on overall system performance.

NTIS

Ducts; Air Conditioning; Energy Technology; System Effectiveness; Residential Energy

20020032313 General Accounting Office, Washington, DC USA

Education Research: Education Should Improve Assessments of R and D Centers, Regional Labs, and Comprehensive Centers

Jan. 2002; 46p; In English; Report to Congressional Requesters

Report No.(s): AD-A398520; GAO-02-190; No Copyright; Avail: Defense Technical Information Center (DTIC)

The Congress and the administration have emphasized the importance of a scientifically sound research base to improve teaching and learning in the nation's schools. to develop this research base and promote the use of research-based practices, the Department of Education (Education) is charged with sponsoring research and developing and disseminating research-based activities, such as technical assistance. Education administers over a thousand grants, cooperative agreements, and contracts that fund educational research, development of materials, new methods of instruction and practices in teaching, dissemination of research results, and technical assistance activities. Some of these grants and contracts are administered through the Office of Educational Research and Improvement (OERI), but others are administered elsewhere in Education.

DTIC

Education; Research Facilities; Research Management; Schools

20020033031 NASA Ames Research Center, Moffett Field, CA USA

Code JEF Facilities Engineering Home Page for the Internet

Mahaffey, Valerie A., NASA Ames Research Center, USA; [1995]; 6p; In English

Contract(s)/Grant(s): RTOP 282-00-00; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

There are always many activities going on in JEF. We work on and manage the Construction of Facilities (C of F) projects at NASA-Ames. We are constantly designing or analyzing a new facility or project, or a modification to an existing facility. Every day we answer numerous questions about engineering policy, codes and standards, we attend design reviews, we count dollars and we make sure that everything at the Center is designed and built according to good engineering judgment. In addition, we study literature and attend conferences to make sure that we keep current on new legislation and standards.

Derived from text

Construction; Pressure Regulators; Research Facilities

32
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.

20020027219 Polytechnic Univ., Farmingdale, NY USA

Predicting Statistical Parameters for UHF and Microwave Propagation in Cities for Advanced Spread Spectrum Design

Final Report, 1 Jul. 1998-30 Jun. 2001

Lu, I-Tai; Bertoni, Henry; Oct. 23, 2001; 6p; In English

Contract(s)/Grant(s): DAAG55-98-1-0359

Report No.(s): AD-A398495; ARO-37693.1-EL; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Our research objective is to develop efficient algorithms for predicting statistical parameters for ultrahigh frequencies and microwave propagation in cities for advanced spread spectrum (systems). In the first year, we have studied the mechanisms contributing to angular spread at base station. We have also developed a ray formalism for modeling propagation in city streets which contain cars, trees, and other scatters. In the second year's simulations of delay spread and angle spread have been carried out using the VPL ray tracing tool in rise and mixed height building environments. Range dependence and shadow fading for residential environment has been simulating for frequencies ranging from 30 MHz to 3 GHz. In addition we have developed a multiple antenna systems to increase channel capacity greatly for by taking advantages of the multipath propagation characteristics. In the third year, the VPL code used evaluation of higher order channel statistics and for the optimization of the mobile assisted hard and soft handoff algorithm parameters. The propagation parameters such as the shadowing standard deviation and the cross-correlation are shown to influence the performance of handoff algorithms. Analysis of foliage effects on radio frequency propagation in urban environments was also performed.

DTIC

Algorithms; Microwaves; Radio Frequencies; Spread Spectrum Transmission; Radio Transmission

20020027228 Clemson Univ., Dept. of Electrical and Computer Engineering, SC USA

Soft Decision Decoding of Convolutional Codes in Direct-Sequence Spread-Spectrum Mobile Wireless Communications

Final Report, 15 Nov. 1997-14 Nov. 2001

Pursley, Michael B.; Nov. 29, 2001; 6p; In English

Contract(s)/Grant(s): DAAG55-98-1-0013

Report No.(s): AD-A398490; ARO-37778.7-EL-DPS; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

New uses of convolutional codes have been developed for nonuniform phase-shift-key (PSK) signaling. Soft-decision decoding of convolutional codes has been investigated for applications of nonuniform PSK modulation to multimedia signaling and multicast transmission in direct-sequence spread-spectrum wireless communication networks. Research has also been conducted on new processing techniques in PSK receivers to provide soft information for decoding of convolutional and turbo codes. Methods were also investigated for the development of soft-decision information in rake receivers for communication over fading multipath channels. Research was initiated on soft-decision decoding for turbo product codes.

DTIC

Decoding; Mobile Communication Systems; Phase Shift Keying; Modulation; Code Division Multiple Access

20020027229 Surface Optics Corp., San Diego, CA USA

Correlation-Induced Frequency Shift from Rough Surface Scattering ***Final Report, 15 Sep. 1998-31 Oct. 2001***

Gu, Zu-Han; Oct. 31, 2001; 23p; In English

Contract(s)/Grant(s): DAAG55-98-C-0034

Report No.(s): AD-A398491; SOC-R7034-004-1001; ARO-37728.11-PH; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A combined theoretical and experimental research program on 'Correlation-induced Frequency Shift from Rough Surface Scattering' has been implemented. This study has increased our understanding of localization, coherence, and fluctuation from rough surface scattering. The results should have potential application in radar signature, telecommunication, remote sensing, satellite tracking, mine detection and target acquisition and classification.

DTIC

Frequency Shift; Scattering; Surface Roughness; Backscattering

20020027243 Colorado Univ., Boulder, CO USA

LEO Satellite Services - Can a Startup Provider Survive?

Schlak, Christopher G.; Dec. 14, 2001; 25p; In English; Original contains color images

Report No.(s): AD-A398476; AFIT-CI02-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In 1958, President Dwight D. Eisenhower became the first person to send a voice transmission over an orbiting satellite when he sent his Christmas message over the SCORE satellite. by 1962, Telstar I was providing real-time video between the USA and France during its short 20-minute window of operation. The telecommunications industry would never be the same once space based telecommunications became a reality. Voice telephony came first, then video broadcasting, and now, two-way digital video broadcasting with IP over satellite data connections. Satellite communication has entered into many facets of the telecommunications industry, but has it reached its limits? Many of the services being offered by today's leading satellite providers are in direct competition with less expensive terrestrial systems. The cost of designing, building, launching, operating, and maintaining a satellite or constellation of satellites is an enormous sum that must be spent before the service is ever offered to the public. With an increasing percentage of the market share converting to terrestrial based services, the following question should be asked of the current Low Earth Orbit (LEO) satellite service industry: Can a LEO startup service provider survive and make money in the current satellite service market?

DTIC

Low Earth Orbits; Data Transmission; Satellite Communication

20020027262 Illinois Univ., Broad of Trustees, Chicago, IL USA

Integrated Satellite Radar Array Processing

Nehorai, Arye; Dec. 2001; 20p; In English

Contract(s)/Grant(s): F49620-99-1-0067

Report No.(s): AD-A398559; AFRL-SR-BL-TR-02-0001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In electromagnetic signal processing, we computed Cramer-Rao bounds and ambiguity functions for estimating range, velocity, and direction using an active radar array. We derived bounds on the mean-square error for estimating vector systems, and analyzed the performance breakdown of subspace-based methods. We proposed methods for target tracking and interference cancellation using EM vector-sensor antennas; we also designed such an antenna of compact shape. We developed methods for fading channel estimation and symbol detection in unknown spatially correlated noise, and finite-length multi-input multi-output (MIMO) adaptive equalization. We also considered the equalization of a channel with discrete multi-tone (DMT) systems and insufficient cyclic prefix. We developed techniques for detecting the wake of a ship using an airborn SQUID magnetic transducer. In acoustics, we analyzed the effects of placements of acoustic vector sensor (AVS's) on the performance of direction finding. We developed methods for direction finding with an AVS's array near a reflecting boundary, and fast wide-band methods for finding the 3D position of a target. We computed expressions for the cross-correlations between wide-band noise components of an AVS's, and developed a noise-reduction algorithm for dual-microphone systems useful for hearing aids. We proposed procedures for detecting explosives with chemical sensing, such as automatic landmine detection and localization using chemical sensor array processing and statistical hypothesis testing. In biomedical applications, we estimated parameters of electrical source in the brain, including their location and moments, using EEG and MEG sensor arrays.

DTIC

Signal Processing; Radar Antennas; Antenna Arrays; Magnetic Transducers; Electroencephalography; Noise Reduction

20020027265 Raytheon Co., Tucson, AZ USA

Advanced Mathematics for Optimizing Missile Seeker Signal Processing ***Final Report, 1 Jul. 1998-20 Dec. 2001***

Schmitt, Harry A.; Dec. 20, 2001; 88p; In English; Original contains color images

Contract(s)/Grant(s): F49620-98-C-0034

Report No.(s): AD-A398610; No Copyright; Avail: CASI; A01, Microfiche; A05, Hardcopy

It is convenient to separate our research program into two periods of performance. The first period of performance corresponds to the Base Program and covers the time period of July 1, 1998 to March 31, 2001. The second period of performance corresponds to the Option Program and covers the time period of April 1, 2001 to December 31, 2001. The objective of the Base Program was a real time demonstration of a ten-fold performance improvement in RF Adaptive Array Processing (AAP) using advanced mathematical techniques. A secondary objective was to demonstrate a performance improvement over conventional AAP by achieving an SNR gain for a target in interference. The objective of the Option Program was to apply some of the general mathematical algorithms for target detection and classification developed under the DARPA DSO Applied and Computational Mathematics Program (ACMP) to a specific sensor modality.

DTIC

Signal Processing; Adaptation; Numerical Analysis; Radio Frequencies

20020027268 Illinois Univ., Electromagnetics Lab., Urbana, IL USA

Scalable Electromagnetic Scattering Computations

Hastriter, Michael L.; Velamparambil, Sanjay; Chew, Weng Cho; Jan. 2001; 5p; In English

Report No.(s): AD-A398621; CI02-9; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In this paper, we summarize the results of our efforts in developing a scalable distributed memory fast electromagnetic integral equation solver. The massively parallel scattering code, called LSSP, is based on a Galerkin discretization of the combined field integral equation (CFIE) using the RWG basis functions. The resulting matrix equation is then solved using a parallel GMRES solver. It uses the distributed memory parallel MLFMA library called ScaleME for evaluating matrix-vector products and Message Passing Interface (MPI) for inter-processor communication. Furthermore. once the solution is obtained, the bistatic RCS is computed using a parallelized, MLFMA based far field evaluation algorithm. The objective of this paper is to present some recent results demonstrating the scalability of the code for solving realistic problems.

DTIC

Electromagnetic Scattering; Integral Equations; Computation; Distributed Memory

20020027526 RECOM Technologies, Inc., Moffett Field, CA USA

Performance Evaluation Tools for Next Generation Scalable Computing Platforms

Yan, Jerry C., RECOM Technologies, Inc., USA; Sarukkai, Sekhar, RECOM Technologies, Inc., USA; [1995]; 1p; In English; America in the Age of Information: A Forum on Federal Information and Communications Research and Development, 6-7 Jul. 1995, Bethesda, MD, USA

Contract(s)/Grant(s): NAS2-14088; RTOP 509-10-31; No Copyright; Avail: Issuing Activity; Abstract Only

The Federal High Performance and Communications (HPCC) Program continue to focus on R&D in a wide range of high performance computing and communications technologies. Using its accomplishments in the past four years as building blocks towards a Global Information Infrastructure (GII), an Implementation Plan that identifies six Strategic Focus Areas for R&D has been proposed. This white paper argues that a new generation of system software and programming tools must be developed to support these focus areas, so that the R&D we invest today can lead to technology pay-off a decade from now. The Global Computing Infrastructure (GCI) in the Year 2000 and Beyond would consists of thousands of powerful computing nodes connected via high-speed networks across the globe. Users will be able to obtain computing in formation services the GCI with the ease of using a plugging a toaster into the electrical outlet on the wall anywhere in the country. Developing and managing the GO requires performance prediction and monitoring capabilities that do not exist. Various accomplishments in this field today must be integrated and expanded to support this vision.

Author

Performance Prediction; Performance Tests; Software Development Tools; Computer Programming; Flying Platforms

20020027546 Rutgers - The State Univ., Piscataway, NJ USA

NIMBLE: Many-Time, Many-Where Communication Support for Information Systems in Highly Mobile and Wireless Environments ***Final Report***

Badrinath, B. R.; Imielinski, Tomasz; Goodman, David; Frenkiel, Richard; Dec. 2001; 8p; In English

Contract(s)/Grant(s): DAAG55-97-1-0322

Report No.(s): AD-A398325; EIN/TIN-226001086; ARO-37512.12-CI; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of the research effort in NIMBLE is the design, evaluation, and deployment of information services using the concept of Infostations. The architecture consists of a ubiquitous low bandwidth wireless network which is augmented with convenient and frequent access to isolated high bandwidth connections called Infostations. This network supports a many-time, many-where communication paradigm that is suited for a wide variety of information services. Different prototypes of Infostations to serve the need of pedestrians and highly mobile users were designed. Downloads of large size files are made possible by strategic placement of Infostations. An additional aspect of this work is our consideration of asymmetric transmission to achieve very small, very low cost terminals having very low energy requirements.

DTIC

Information Systems; Prototypes; Systems Engineering; Communication Networks; Systems Management

20020027888 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Spaceborne Microwave Instrument for High Resolution Remote Sensing of the Earth's Surface Using a Large-Aperture Mesh Antenna

Njoku, E., Jet Propulsion Lab., California Inst. of Tech., USA; Wilson, W., Jet Propulsion Lab., California Inst. of Tech., USA; Yueh, S., Jet Propulsion Lab., California Inst. of Tech., USA; Freeland, R., Jet Propulsion Lab., California Inst. of Tech., USA; Helms, R., Jet Propulsion Lab., California Inst. of Tech., USA; Edelstein, W., Jet Propulsion Lab., California Inst. of Tech., USA; Sadowy, G., Jet Propulsion Lab., California Inst. of Tech., USA; Farra, D., Jet Propulsion Lab., California Inst. of Tech., USA; West, R., Jet Propulsion Lab., California Inst. of Tech., USA; Oxnevad, K., Jet Propulsion Lab., California Inst. of Tech., USA; September 2001; 174p; In English

Contract(s)/Grant(s): NAS7-1407

Report No.(s): JPL-Publ-01-09; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report describes a two-year study of a large-aperture, lightweight, deployable mesh antenna system for radiometer and radar remote sensing of the Earth from space. The study focused specifically on an instrument to measure ocean salinity and Soil moisture. Measurements of ocean salinity and soil moisture are of critical . importance in improving knowledge and prediction of key ocean and land surface processes, but are not currently obtainable from space. A mission using this instrument would be the first demonstration of deployable mesh antenna technology for remote sensing and could lead to potential applications in other remote sensing disciplines that require high spatial resolution measurements. The study concept features a rotating 6-m-diameter deployable mesh antenna, with radiometer and radar sensors, to measure microwave emission and backscatter from the Earth's surface. The sensors operate at L and S bands, with multiple polarizations and a constant look angle, scanning across a wide swath. The study included detailed analyses of science requirements, reflector and feedhorn design and performance, microwave emissivity measurements of mesh samples, design and test of lightweight radar electronic~., launch vehicle accommodations, rotational dynamics simulations, and an analysis of attitude control issues associated with the antenna and spacecraft, The goal of the study was to advance the technology readiness of the overall concept to a level appropriate for an Earth science emission. Author

Remote Sensing; Antennas; Radiometers; Earth Observations (From Space); Satellite-Borne Radar

20020028010 National Telecommunications and Information Administration, Inst. for Telecommunication Sciences, Boulder, CO USA

Implementation and Testing of a Software Defined Radio Cellular Base Station Receiver

Wepman, J. A.; Hoffman, J. R.; Jul. 2001; 30p; In English

Report No.(s): PB2002-101944; NTIA-01-388; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Software defined radios (SDR's) represent a departure from traditional radio design. There is some mystigue about what SDR's are, how they are designed, how they operate, and how performance is determined or verified. This report provides insight into some of these SDR aspects by presenting a detailed example SDR receiver design along with a set of performance measurements at various stages of the receiver. For this example, an Advanced Mobile Phone System (AMPS) cellular B-band base station receiver was configured using SDR technology. The architecture consists of a cellular B-band analog downconverter and digitizer, a digital downconverter that operates in a personal computer, a first-in, first-out (FIFO) buffer memory board, and

an analog audio processor. The modular architecture permits signals to be observed at several stages of processing: the digitized IF output, the digitally downconverted and filtered baseband output, the digital FM demodulator output, and the analog audio output. A wide variety of measurements under various RF input signal conditions were made at each of the processing stages. Results of particular interest include the effects of aliasing and the ability to detect a low-level desired signal in the presence of a high-level, in-band interfering signal. The SDR AMPS receiver, while possessing the inherent flexibility advantages of SDR's easily met the TIA/EIA-712 cellular base station standards for adjacent and alternate channel desensitization, intermodulation spurious response attenuation, and protection against spurious response attenuation.
NTIS
Radio Receivers; Analog to Digital Converters; Demodulators; Intermodulation

20020028016 NASA Glenn Research Center, Cleveland, OH USA
Intersymbol Interference Investigations Using a 3D Time-Dependent Traveling Wave Tube Model
Kory, Carol L., Analex Corp., USA; Andro, Monty, NASA Glenn Research Center, USA; [2001]; 20p; In English
Contract(s)/Grant(s): NAS3-27600; RTOP 632-6E-51; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
For the first time, a physics based computational model has been used to provide a direct description of the effects of the TWT (Traveling Wave Tube) on modulated digital signals. The TWT model comprehensively takes into account the effects of frequency dependent AM/AM and AM/PM conversion; gain and phase ripple; drive-induced oscillations; harmonic generation; intermodulation products; and backward waves. Thus, signal integrity can be investigated in the presence of these sources of potential distortion as a function of the physical geometry of the high power amplifier and the operational digital signal. This method promises superior predictive fidelity compared to methods using TWT models based on swept amplitude and/or swept frequency data. The fully three-dimensional (3D), time-dependent, TWT interaction model using the electromagnetic code MAFIA is presented. This model is used to investigate assumptions made in TWT black box models used in communication system level simulations. In addition, digital signal performance, including intersymbol interference (ISI), is compared using direct data input into the MAFIA model and using the system level analysis tool, SPW (Signal Processing Worksystem).
Author
Intersymbolic Interference; Three Dimensional Models; Traveling Wave Tubes; Mathematical Models; Modulation

20020028361 National Defence Research Establishment, Linkoeping, Sweden
Investigation of Two Wideband UHF Radio Channel Models
Loefsved, E.; Nov. 1999; 72p; In English
Report No.(s): PB2002-102548; FOA-R-99-01279-504-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
During development of radio communication equipment, some kind of channel model often has to be used for testing and evaluation. There are several models for narrowband channels but often the channel can not be assumed to be narrowband. In this Master Thesis an investigation of two UHF wideband channel models has been made. The two models we have chosen to investigate is one that we here call Dersch's model and the GSM model. Dersch's model is chosen since it is based on the physical propagation environment and that in theory it has infinite bandwidth. We compare it with the GSM model, which is widely used. We have found that the models in some cases are comparable. Dersch's model, which is more flexible than the GSM model, has to be adjusted to give results similar to the GSM model. We have also found that the classes for the environments in the two models do not always describe the same propagation environment.
NTIS
Radio Communication; Ultrahigh Frequencies; Broadband; Channels (Data Transmission)

20020029727 California Inst. of Tech., Applied and Computational Mathematics, Pasadena, CA USA
Electromagnetic Scattering ***Final Report, 15 Oct. 1998 - 14 Oct 2001***
Bruno, Oscar P., California Inst. of Tech., USA; Jan. 2002; 7p; In English
Contract(s)/Grant(s): F49620-99-1-0010
Report No.(s): AD-A398468; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Application of the method of boundary variations to the calculation of electromagnetic scattering from the ocean. Introduction of new, high frequency approximations (series expansions in powers of the wavelength) for use in conjunction with boundary variations in oceanic applications. Application of the method of boundary variations in the solution of eigenvalue problems. Development of fast high-order integral methods for solution of problems of electromagnetic scattering involving surfaces and volumes in three dimensional space.
DTIC
Electromagnetic Scattering; Oceans; Series Expansion; Integral Calculus; Boundary Integral Method; Boundary Conditions

20020030199 Center for Mathematics and Computer Science, Amsterdam Netherlands

Network Quality of Service for Multimedia Presentation Generation Systems. Information Systems

Cornelissen, F. J.; May 31, 2001; 20p; In English

Report No.(s): PB2002-103672; INS-R0106; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Quality of Service (QoS) protocols and architectures play an important role in distributed multimedia systems since multimedia presentations need to be played for the user without stalls, necessitating guaranteed response times. However in the Internet no other QoS than best-effort is given. This report investigates some QoS architectures and protocols designed to overcome these limitations and looks at the applications of these protocols for multimedia systems. Given the recent research on (semi-)automatically generated multimedia presentations, this report investigates the opportunities to gear the generated multimedia presentations toward the specifc network conditions of the client requesting a document, and dynamically adapting the presentation as network conditions change.

NTIS

Multimedia; Information Systems

20020030201 Center for Mathematics and Computer Science, Amsterdam Netherlands

Known-Item Retrieval on Broadcast TV. Information Systems

List, J. A.; van Ballegooij, A. R.; de Vries, A. P.; Apr. 30, 2001; 18p; In English

Report No.(s): PB2002-103670; INS-R0104; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Many content-based, multimedia retrieval systems are based on a feature-oriented approach to querying, mostly exposing a fixed set of features (introduced at design time) for querying purposes. This restriction to a limited set of features is problematic for two reasons: it restricts the expressiveness at the semantic level, and it seems unfeasible to obtain (a-priori) a sufficiently powerful set of features for all possible queries. We describe an alternative approach where users specify precisely the distinguishable characteristics of the desired result set. In this query process, the user first describes a representation of the content (based on a feature or collection of features) and then tells the system how to apply the representation in the search. Our prototype video retrieval system allows the expression of such queries as a sequence of operations, on MPEG video and audio streams, that can be executed on our database system. While the low-level decompression stage is implemented in an imperative programming language, the actual retrieval approach is expressed in declarative database queries. We assessed this system with a case study in known-item retrieval on broadcast video streams: detecting news bulletins in the stream, with the help of both audio and video information.

NTIS

Television Systems; Broadcasting; Information Systems

20020030273 Naval Postgraduate School, Monterey, CA USA

Bandwidth Requirements for the Advanced Amphibious Assault Vehicle (AAAV) Command Variant

Wedge, James P.; Sep. 2001; 55p; In English

Report No.(s): AD-A397643; No Copyright; Avail: Defense Technical Information Center (DTIC)

The goal of this thesis is to identify the bandwidth requirements for the command variant of the Advanced Amphibious Assault Vehicle (AAAV). The work focuses on the network established to support an infantry battalion COC. At the center of this network will be the AAAV(C) All higher and subordinate communications links that connect directly with the AAAV(C) are modeled. The intent is to identify all traffic received and transmitted through the AAAV(C). Current systems are not discussed, as this study is intended to be independent of current system characteristics. The model is based on Internet Protocols (IP) , with all communications, including voice and video, routed via IP addresses. This model attempts to provide better fidelity for future requirements analysis. Data on message size and transmission interval are identified that will allow grouping and analysis of message sets for future systems. Doctrinal messages appropriate for each node (unit) are identified and each message is then assigned a size (bits), and a transmission interval (minutes). Using a maneuver ashore scenario, network traffic flows for a 24-hour period are modeled with the software simulation tool Extend(TM). The model is then optimized and the minimum bandwidth required to support the scenario is identified.

DTIC

Amphibious Vehicles; Bandwidth; Computerized Simulation; Communication Networks; Command Modules

20020030299 Illinois Univ., Dept. of Electrical Engineering and Computer Science, Chicago, IL USA

Retrieval from Video and Pictorial Databases Employing Similarity and Motion ***Final Report, 1 Jul. 1998-30 Jun. 1999***

Ben-Arie, Jezekiel; Sistla, A. P.; Yu, Clement; Nov. 01, 1999; 8p; In English

Contract(s)/Grant(s): DAAG55-98-1-0424

Report No.(s): AD-A398364; ARO-37714.1-CI; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project focuses on research towards the development of a system for similarity based retrieval from video and pictorial databases. The specific aims of the work are development of an image understanding system for detecting humans in videos, development of an expressive query language called Hierarchical Temporal Logic (HTL), for spatio-temporal queries on video databases and an initial development of activity recognition module that tracks and recognizes human actions in videos. In this project, we have already developed head and face detection algorithms and also developed an initial tracking system for human body parts. An initial graphical base query system was developed for expressing spatio-temporal queries on video databases. All these algorithms are now combined in a web demo. Our plans for the coming six months which are left in this 1 year program is to extend our tracking, recognition and querying algorithms. We plan to develop more robust head and limb detection and also to develop an initial algorithm for human activity recognition as well as extending the querying system to include hierarchical query structures.

DTIC

Query Languages; Information Retrieval; Pattern Recognition

20020030819 Air Command and Staff Coll., Maxwell AFB, AL USA

Deflating British Radar Myths of World War II

Clark, Gregory C.; Mar. 1997; 47p; In English

Report No.(s): AD-A397960; AU/ACSC/0609F/97-3; No Copyright; Avail: Defense Technical Information Center (DTIC)

British and Allied memoirs and histories have contributed to the rise of three myths concerning the discovery and employment of radar. These myths are as follows. The first myth is that Sir Robert Watson-Watt is the father and sole inventor of radar. The second is that Germany's discovery and realization of radar's military worth occurred after 1940 following exposure to British systems. The third myth gives radar the pivotal role in the defeat of the Luftwaffe in the Battle of Britain. to deflate these myths the origin of radar is traced from James Maxwell's discovery of radio waves to early radar theorists and inventors. Their role in the story of radar illuminates and contributes to the deflation of the radar myths. Both the rebirth of the Luftwaffe and evolution of the RAF. during the 1920's and 1930's shows how each service independently arrived at the development of radar technology for different reasons. In 1939 Germany possessed some of the world's best and most enduring radar designs, as well as essential navigation and bombing aids. England's Chain Home radar was a dead end technology with serious shortcomings, but was skillfully melded to an innovative command and control system. The illumination of German radar achievement and a balanced analysis of British defensive system essentially deflates the radar myths.

DTIC

Warfare; Radar

20020031147 National Defence Research Establishment, Dept. of Command and Control Warfare Technology, Linkoeping, Sweden

Reactive Routing in Tactical Radio Networks

Sterner, U.; Johansson, E.; Sep. 2000; ISSN 1104-9154; 42p; In English

Report No.(s): PB2002-102546; FOA-R-00-01597-504-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To uphold communications in all types of situations in the future defense a mobile tactical radio network, that is independent of pre-deployed infrastructure, is important. One useful method to achieve robustness and area-coverage for this type of network is through the relaying of messages through intermediate nodes, thus creating a multi-hop network. to control and direct the traffic through the network, routing is an important issue. In a tactical scenario where units move fast through terrain, the changes in network topology are very fast. This yields very high demands on the routing and access algorithms upholding the network.

NTIS

Communication Networks; Radio Communication; Telecommunication

20020031759 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA

'Party Line' Information Use Studies and Implications for ATV Datalink Communications

Pritchett, Amy, Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; Midkiff, Alan, Massachusetts Inst. of Tech., USA; [1995]; 6p; In English; 14th AIAA/IEEE Digital Avionics Systems Conference, 6-9 Nov. 1995, Cambridge, MA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Previously announced as 19980114699

Contract(s)/Grant(s): NAG2-716; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

The perceived importance and utilization of 'party line' information by air carrier flight crews was investigated through pilot surveys and a flight simulation study. The Importance, Availability, and Accuracy of party line information elements were explored through surveys of pilots of several operational types. The survey identified numerous traffic and weather party line information elements which were considered important. These elements were scripted into a full-mission flight simulation which examined the utilization of party line information by studying subject responses to specific information element stimuli. The awareness of the different Party Line elements varied, and awareness was also affected by pilot workload. In addition, pilots were aware of some traffic information elements, but were reluctant to act on Party Line Information alone. Finally, the importance of party line information appears to be greatest for operations near or on the airport. This indicates that caution should be exercised when implementing datalink communications in tower and close-in terminal control sectors.

Author

Data Links; Pilot Performance; Availability; Accuracy; Information Flow; Human Reactions

20020031760 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA

Variations in "Party Line" Information Importance Between Pilots of Difference Characteristics

Pritchett, Amy R., Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; [1995]; 6p; In English; Eighth International Symposium on Aviation Psychology, Apr. 1995, Columbus, OH, USA; Previously announced as 19980147199

Contract(s)/Grant(s): NAG2-716; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

The introduction of digital datalink communications into the air traffic control (ATC) system may cause a reduction of the situation awareness of flight crews due to the reduction of 'Party Line' Information (PLI) that can be overheard on the shared voice frequencies. A survey was distributed to determine current PLI use by pilots from different geographic regions, operational groups, experience levels, and aircraft equipage. Pilots indicated highest perceived importance for PLI during the phases of flight nearest the airport and lowest importance during cruise. Several specific traffic and weather information elements were identified as particularly important; traffic and weather information was also cited by pilots as information required for global situation awareness. Some variations in responses were found between pilots from different operational types.

Author

Air Traffic Control; Pulse Communication; Data Links; Situational Awareness

20020032234 Air Command and Staff Coll., Maxwell AFB, AL USA

Crisis Communication: A Commander's Guide to Effective Crisis Communication

Woodyard, Tyrone M.; Apr. 1998; 55p; In English

Report No.(s): AD-A398906; AU/ACSC/307/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

This research paper is a review of Air Force crisis communication training for commanders. As the primary spokesperson for their organization, commanders must know how to communicate during a crisis. This leads to the research question. How does the Air Force prepare commanders to communicate during a crisis and are they using effective crisis communication techniques. The methodology is a review of crisis and crisis communication literature to develop a working definition of a crisis and crisis communication. The Air Force's Media Training program and training techniques are also reviewed to identify and describe effective crisis techniques. The crisis communication training program or a civilian crisis communication firm, Wilson Group Communications, is also reviewed. This comparison will provide information to help determine the effectiveness of the Air Force training program compared to a civilian organization. The comparisons identified common crisis communication techniques and provide information for a commanders guide. The research concludes that the Air Force has a very credible crisis communication training program for commanders. It's required training and the information, techniques and skills taught are identical to the Wilson Group program. The Air Force teaches crisis communication techniques recognized by leading crisis communication researchers, scholars and practitioners.

DTIC

Armed Forces (USA); Telecommunication; Personnel Management

20020032301 Norwegian Defence Research Establishment, Kjeller, Norway

Architectures and Standards for Network Management ***Arkitekturar og Standardar For Drift og Styring av Kommunikasjonsnett***

Winjum, Eli, Norwegian Defence Research Establishment, Norway; Sep. 05, 2001; 132p; In Norwegian; Original contains color illustrations

Contract(s)/Grant(s): FFIE Proj. 794/110

Report No.(s): FFI/RAPPORT-2001-04331; ISBN 82-464-0563-2; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The report reviews present architectures and standards for network management. It especially investigates the context and structure of management information as well as the information exchange in network management systems built upon the two dominating families of standards. An overview on future proposals is given. Partly in contrast to present architectures, these concepts emphasize distributed network management. Important trends in this development are presented.

Author

Management Information Systems; Information Management; Communication Networks

20020032302 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA

Identification of Important ”Party Line” Information Elements and the Implications for Situational Awareness in the Datalink Environment

Midkiff, Alan H., Massachusetts Inst. of Tech., USA; Hansman, R. John, Jr., Massachusetts Inst. of Tech., USA; May 07, 1992; 110p; In English

Contract(s)/Grant(s): NAG2-716

Report No.(s): ASL-92-2; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Air/ground digital datalink communications are an integral component of the FAA’s Air Traffic Control (ATC) modernization strategy. With the introduction of datalink into the ATC system, there is concern over the potential loss of situational awareness by flight crews due to the reduction in the ”party line” information available to the pilot. ”Party line” information is gleaned by flight crews overhearing communications between ATC and other aircraft. In the datalink environment, party line information may not be available due to the use of discrete addressing. Information concerning the importance, availability, and accuracy of party line elements was explored through an opinion survey of active air carrier flight crews. The survey identified numerous important party line elements. These elements were scripted into a full-mission flight simulation. The flight simulation experiment examined the utilization of party line information by studying subject responses to the specific information elements. Some party line elements perceived as important were effectively utilized by flight crews in the simulated operational environment. However, other party line elements stimulated little or no increase in situational awareness. The ability to assimilate and use party line information appeared to be dependent on workload, time availability, and the tactical/strategic nature of the situations. In addition, the results of both the survey and the simulation indicated that the importance of party line information appeared to be greatest for operations near or on the airport. This indicates that caution must be exercised when implementing datalink communications in these high workload, tactical sectors. This document is based on the thesis of Alan H. Midkiff submitted in partial fulfillment of the degree of Master of Science in Aeronautics and Astronautics at the Massachusetts Institute of Technology.

Author

Data Links; Voice Communication; Situational Awareness; Air Traffic Control; Autonomy; Pulse Communication

20020032693 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA

”Party Line” Information Use Studies and Implications for ATC Datalink Communications

Hansman, R. John, Massachusetts Inst. of Tech., USA; Pritchett, Amy, Massachusetts Inst. of Tech., USA; Midkiff, Alan, Massachusetts Inst. of Tech., USA; [1995]; 9p; In English; Fifth International Conference on Human-Machine Interaction and Artificial Intelligence in Aerospace, 27-29 Sep. 1995, Toulouse, France; Previously announced as 19980114699

Contract(s)/Grant(s): NAG2-716; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The perceived importance and utilization of ’party line’ information by air carrier flight crews was investigated through pilot surveys and a flight simulation study. The importance, availability, and accuracy of party line information elements were explored through surveys of pilots of several operational types. The survey identified numerous traffic and weather party line information elements which were considered important. These elements were scripted into a full-mission flight simulation which examined the utilization of party line information by studying subject responses to specific information element stimuli. The awareness of the different Party Line elements varied, and awareness was also affected by pilot workload. In addition, pilots were aware of some traffic information elements, but were reluctant to act on Party Line Information alone. Finally, the results of both the survey and the simulation indicated that the importance of party line information appeared to be greatest for operations near or on the airport.

This indicates that caution should be exercised when implementing datalink communications in tower and close-in terminal control sectors.
Author
Air Traffic Control; Data Links; Pilot Performance; Flight Simulation; Information Systems

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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.

20020027227 Wisconsin Univ., Madison, WI USA
Monolithic Three-Dimensional Micromachined Transmission Lines and Antennas ***Final Report, 10 Jul. 1998-31 Aug. 1999***
Gearhart, Steven; Nov. 09, 2001; 5p; In English
Contract(s)/Grant(s): DAAG55-98-1-0455
Report No.(s): AD-A398489; ARO-376301.1-EL-YIP; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Highly-coupled couplers (3-dB and 6-dB) are necessary for a wide range of millimeter-wave coplanar circuits. The high line-to-line capacitance required for these couplers is impossible to achieve with thin-film planar coupled lines. Using 80 microns-thick conductors patterned using a 3-D x-ray micromachining technique, we have successfully demonstrated a 15 GHz 6-dB coupler and a single-section coupled-line BPF that utilizes a 3-dB coupler geometry.
DTIC
Couplers; Micromachining

20020027236 Michigan Univ., Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI USA
An Acoustic Parametric Effect MEMS Amplifier/Transducer for Sonar Applications ***Final Report, 10 Jul. 1998-9 Jul 2001***
Rebeiz, Gabriel M.; Jul. 2001; 3p; In English
Contract(s)/Grant(s): DAAG55-98-1-0432
Report No.(s): AD-A398484; RADLAB-03729DEC01; ARO-38962.2-EL; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have developed the first MEMS parametric amplifier for Sonar applications. The device used is a MEMS time-varying capacitor which is composed of an array of low-stress metalized silicon-nitride diaphragms, and is pumped by a large signal voltage at 1.64 MHz. This induces a large change in the capacitance, and results in parametric amplification of an input signal at 200 kHz. to our knowledge, this device is the first-ever MEMS mechanical up-converter parametric-effect amplifier developed with an up-conversion ratio of 9:1. The measurements agree very well with theory, including the effect the series resistance and the Q of the MEMS time-varying capacitor. The application areas are in amplifiers which operate at very high temperatures (200-600 degrees Celsius), under high particle bombardment (nuclear applications), in non semiconductor-based amplification, and in low-noise systems since parametric amplifiers do not suffer from thermal, shot or noise problems.
DTIC
Sonar; Transducers; Parametric Amplifiers; Audio Equipment

20020027261 Pennsylvania State Univ., State College, PA USA
Pressure Tuning of Intermediate Valence and Multiband Semiconductor Thermoelectric Materials ***Final Report***
Badding, John V.; DiSalvo, Francis J.; Mahan, Gerald D.; Jul. 27, 2001; 9p; In English; Prepared in collaboration with Cornell University and University of Tennessee
Contract(s)/Grant(s): N00014-97-1-0565
Report No.(s): AD-A398573; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The conventional means of searching for new materials, in this case efficient thermoelectrics, is to synthesize a large number of compounds and investigate each in detail as a function of materials parameters, such as preparation conditions and doping levels. Each compound thus represents one point in a phase space determined by electronic and structural parameters. With the use of pressure one can continuously adjust the interaction parameters and follow the change in properties for each compound. During the period of this grant, we demonstrated that antimony bismuth telluride can be pressure tuned to exhibit a thermoelectric figure of merit that is at least a factor of two higher than any known material at ambient pressure. This demonstration that higher ZT is possible under pressure is a valuable ”existence proof”. We have developed an understanding of origin of the increase in

the thermoelectric power associated with an electronic topological transition. This new understanding suggests future research directions for ambient pressure chemical tuning.
DTIC
Pressure; Tuning; Thermoelectricity; Valence; Semiconductors (Materials)

20020027284 Fermi National Accelerator Lab., Batavia, IL USA
Single event effects in the pixel readout chip for BTeV
Chiodini, G.; Dec. 07, 2001; 15p; In English
Report No.(s): DE2001-789373; FERMILAB-CONF-01/369-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In future experiments the readout electronics for pixel detectors is required to be resistant to a very high radiation level. In this paper we report on irradiation tests performed on several preFPIX2 prototype pixel readout chips for the BTeV experiment exposed to a 200 MeV proton beam. The prototype chips have been implemented in commercial 0.25 (micro)m CMOS processes following radiation tolerant design rules. The results show that this ASIC design tolerates a large total radiation dose, and that radiation induced Single Event Effects occur at a manageable level.
NTIS
Pixels; Irradiation; Single Event Upsets; Radiation Detectors

20020027674 Fermi National Accelerator Lab., Batavia, IL USA
Study of thermal cycling and radiation effects on indium and solder bump bonds
Kwan, S.; Dec. 11, 2001; 4p; In English
Report No.(s): DE2001-789479; FERMILAB-CONF-01/377-E; No Copyright; Avail: Department of Energy Information Bridge

The BTeV hybrid pixel detector is constructed of readout chips and sensor arrays which are developed separately. The detector is assembled by flip-chip mating of the two parts. This method requires the availability of highly reliable, reasonably low cost fine-pitch flip-chip attachment technology. We have tested the quality of two bump-bonding technologies; indium bumps (by Advanced Interconnect Technology Ltd. (AIT) of Hong Kong) and fluxless solder bumps (by MCNC in North Carolina, USA). The results have been presented elsewhere (1). In this paper we describe tests we performed to further evaluate these technologies. We subjected 15 indium bump-bonded and 15 fluxless solder bump-bonded dummy detectors through a thermal cycle and then a dose of radiation to observe the effects of cooling, heating and radiation on bump-bonds. We also exercised the processes of HDI mounting and wire bonding to some of the dummy detectors to see the effect of these processes on bump bonds.
NTIS
Radiation Detectors; Indium; Radiation Effects; Soldered Joints; Thermal Cycling Tests

20020028799 Zarlink Semiconductor, Inc., Plymouth, UK
Integrating EEPROM, Resistor, Capacitor, PIN Diode, Schottky Diode and Bipolar Modules into a 0.35 Micron CMOS Process Optimised for Low Voltage Applications
Ellis, John, Zarlink Semiconductor, Inc., UK; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 6-10; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

We have integrated EEPROMs (electrically-erasable programmable read only memories), resistors, capacitors, PIN diodes, Schottky diodes, an isolated NPN bipolar transistor and dual-poly gate complementary metal oxide semiconductor (CMOS) transistors into a 0.35 micron technology. This provides low threshold voltage transistors for 1-3 V battery operation, high voltage transistors for EEPROM programming, and a number of passive components for mixed-signal functions. Applications for this technology include Zarlink's medical products where programmability enables complex circuits to be optimized for individual customer requirements.
Author
CMOS; Transistors; Integrated Circuits; Miniaturization

20020028806 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Radiation Response of Emerging FeRAM Technology
Nguyen, D. N., Jet Propulsion Lab., California Inst. of Tech., USA; Scheick, L. Z., Jet Propulsion Lab., California Inst. of Tech., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 77-79; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The test results of measurements performed on two different sizes of ferroelectric random access memory (FeRAM) suggest the degradation is due to the low radiation tolerance of sense amplifiers and reference voltage generators which are based on commercial complementary metal oxide semiconductor (CMOS) technology. This paper presents total ionizing dose (TID) testing of 64Kb Ramtron FM1608 and 256Kb Ramtron FM1808.
Author
CMOS; Degradation; Radiation Tolerance; Random Access Memory; Ferroelectric Materials

20020028820 University of North London, School of Informatics and Multimedia Technology, London, UK
A Modified MRAM Architecture Without a Current Rectifier Per Cell
Wang, Frank, University of North London, UK; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 195-198; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

This paper modifies the magnetic random access memory (MRAM) architecture by removing a current rectifier per cell without sacrificing performance. A read operation of stored data is maintained by introducing a simple concept of 'virtual ground' of operational amplifier. The modified MRAM design offers a reduced element area with a little penalty of an addition of one switch per column, which occupies a very small silicon area. As a result, a tenfold improvement in storage density has been achieved by an experimental device.
Author
Architecture (Computers); Magnetic Storage; Memory (Computers); Magnetoresistivity

20020028821 Lehigh Univ., Bethlehem, PA USA
Characterization of Scaled SONOS NVSM Devices for Space and Military Applications
Wrazien, Stephen J., Lehigh Univ., USA; Faul, Jonathan M., Lehigh Univ., USA; Zhao, Yi-Jie, Lehigh Univ., USA; White, Marvin H., Lehigh Univ., USA; Adams, Dennis A., Northrop Grumman Corp., USA; Murray, James R., Sandia National Labs., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 80-86; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We present results on scaled Silicon-Oxide-Nitride-Oxide-Silicon (SONOS) non-volatile semiconductor memory (NVSM) devices designed specifically for high-density, EEPROMs (electrically-erasable programmable read only memories) operating in space and military environments. We describe scaling considerations and process optimization to achieve low-voltage operation (+7 V write for 2.5 ms/-7 V erase for 7.5 ms) with 10-year retention at 80 C. We have conducted studies on 'oxynitride' films at temperatures ranging from 22-250 C. An extrapolated 10-year memory window of 1.2 V is obtained at 22 C reducing to an acceptable 0.8 V at 80 C. SONOS device trap density profiles are compared for both 'oxynitride' and 'silicon-rich' nitride films.
Author
Computer Storage Devices; Semiconductor Devices; Memory (Computers); Temperature Effects

20020028822 Peregrine Semiconductor Corp., San Diego, CA USA
Reliability and Radiation Characterization of an SOI EEPROM/Flash Memory Cell
Peterson, Hank, Peregrine Semiconductor Corp., USA; Tabbert, Chuck, Peregrine Semiconductor Corp., USA; Wright, Frank, Peregrine Semiconductor Corp., USA; Anthony, Hal, Peregrine Semiconductor Corp., USA; Reedy, Ron, Peregrine Semiconductor Corp., USA; Cable, Jim, Peregrine Semiconductor Corp., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 64-67; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

This paper describes the on-going work, sponsored through the Defense Threat Reduction Agency (DTRA) SBIR program, at Peregrine Semiconductor Corp to characterize radiation and endurance behavior of the Peregrine's patented PlusCell(TM) - a new nonvolatile memory cell which utilizes a standard complementary metal oxide semiconductor (CMOS) process on a silicon on insulator technology.
Author
CMOS; Computer Storage Devices; Memory (Computers); Radiation Effects

20020028823 Houston Univ., Space Vacuum Epitaxy Center, TX USA
A New Concept for Non-Volatile Memory: The Electric-Pulse Induced Resistive Change Effect in Colossal Magnetoresistive Thin Films
Liu, S. Q., Houston Univ., USA; Wu, N. J., Houston Univ., USA; Ignatiev, A., Houston Univ., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 18-24; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

A novel electric pulse-induced resistive change (EPIR) effect has been found in thin film colossal magnetoresistive (CMR) materials, and has shown promise for the development of resistive, nonvolatile memory. The EPIR effect is induced by the application of low voltage (is less than 4 V) and short duration (is less than 20 ns) electrical pulses across a thin film sample of a CMR material at room temperature and under no applied magnetic field. The pulse can directly either increase or decrease the resistance of the thin film sample depending on pulse polarity. The sample resistance change has been shown to be over two orders of magnitude, and is nonvolatile after pulsing. The sample resistance can also be changed through multiple levels - as many as 50 have been shown. Such a device can provide a way for the development of a new kind of nonvolatile multiple-valued memory with high density, fast write/read speed, low power-consumption, and potential high radiation-hardness.
Author
Electric Pulses; Magnetoresistivity; Memory (Computers); Thin Films

20020029730 International Society for Optical Engineering, Taiwan, Province of China
Input/Output and Imaging Technologies II
Liu, Yung Sheng, Editor, Industrial Technology Research Inst., Taiwan, Province of China; Huang, Thomas S., Editor, Industrial Technology Research Inst., Taiwan, Province of China; July 2000; ISSN 0277-786X; 266p; In English; 2nd; Input/Output and Imaging Technologies II, 26-27 July 2000, Taipei, Taiwan, Province of China; Sponsored by International Society for Optical Engineering, Taiwan, Province of China; Meeting sponsored in part by the Photonics Industry Development Association.
Report No.(s): AD-A398459; ISBN O-8194-3719-0; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche
This second conference on Input/Output and Imaging Technologies, part of the International Optoelectronics Symposium Held in Taipei, Taiwan on 26-28 July 2000 in conjunction with Photonics Taiwan 2000. This year's conference themes are: 3D object representation and vision-based applications, output devices and imaging, digital camera design and applications, and color imaging.
DTIC
Imaging Techniques; Image Processing; Conferences

20020029846 Los Alamos National Lab., NM USA
US NHMFL 100 TESLA Multi-Shot Magnet
Bacon, J. L.; Ammerman, C. N.; Sep. 01, 2001; 5p; In English
Report No.(s): DE2001-786730; LA-UR-01-5259; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The design, analysis and fabrication progress of the 100 T Multi-Shot Magnet is described. The description includes the structural analysis of the outer coil set, the fabrication of the 100 T prototype coil 1, the fabrication of a coil 1 test shell, and the analysis of the electrical busbar assembly. Fabrication issues and their solutions are presented. This magnet will be installed as part of the user facility research equipment at the U.S. National High Magnetic Field Laboratory (NHMFL) Pulsed Field Facility at Los Alamos National Laboratory.
NTIS
Magnets; Magnetic Fields; Design Analysis

20020030248 Fermi National Accelerator Lab., Batavia, IL USA
Superconducting superferric dipole magnet with cold iron core for the VLHC
Foster, G. W.; Kashikhin, V.; Dec. 28, 2001; 5p; In English
Report No.(s): DE2001-789806; FERMILAB-CONF-01/383-T; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The magnet system of the Very Large Hadron Collider (VLHC) Stage 1 is based on a superconducting 2 Tesla magnetic field combined function magnets. These magnets will have a room temperature iron core with two 20 mm air gaps. Magnetic field in both horizontally separated air gaps is excited by a signal turn 100 kA superconducting transmission line. The alternative design with cold iron core, horizontally or vertically separated air gaps is under investigation. The cold iron option with horizontally separated air gaps reduces the amount of iron, which is one of the main cost driver 233 km length magnet system of the future accelerator. The vertical beam separation decreases volume superconductor, heat load from synchron radiation and eliminates frigning field from a return bus. But the horizontal beam separation has lowest volume of iron core and as a result lower heat load for cryosystem during cooling down. All these options are discussed and comparison is made. Superconducting correction system, combined with the magnet, allowing to increase the maximum field is also under discussion. Preliminary cost analyses are made for all options.
NTIS
Superconducting Magnets; Magnetic Fields; Magnets; Transmission Lines

20020030294 Vanderbilt Univ., Dept. of Mechanical and Materials Engineering, Nashville, TN USA
Ultraminiature Piezomechanisms ***Final Report, 1 Jun. 1995-31 Dec. 1998***
Garcia, Ephrahim; Duong, Khanh; Jan. 01, 1999; 145p; In English
Contract(s)/Grant(s): N00014-95-1-0830
Report No.(s): AD-A398357; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A rotary inchworm-motor using piezoelectric actuators was developed. The motor design has the advantage of a macro and micro stepper motor with high torque and speed. The design is capable of fast angular positioning with micro level accuracy. The rotary motor, as designed, can also be used as a clutch/ brake mechanism. Experimental results demonstrating the prototype's performance based on the aforementioned design considerations are presented. Also proposed herein is a novel way to improve the performance of piezoelectric inchworm motor through optimization of the input signals. The optimized waveforms are verified to improve the performance of the motor in both speed and precision without adding hardware or complexity into the motor.

DTIC

Piezoelectric Motors; Piezoelectric Actuators; Miniature Electronic Equipment

20020031753 Defense Advanced Research Projects Agency, Arlington, VA USA
Smaller, Smarter C4ISR: Presentation to Defense Science and Technology Seminar
Fernandez, F. L.; Dec. 08, 2000; 16p; In English; Original contains color images
Report No.(s): AD-A398638; No Copyright; Avail: Defense Technical Information Center (DTIC)

A DARPA presentation which discusses the needs for smaller and smarter C4ISR (Command, Control, Communications, Computer, Surveillance, Reconnaissance) technologies.

DTIC

Miniaturization; Microelectromechanical Systems; Command and Control; Computer Systems Design; Reconnaissance; Surveillance; Telecommunication

20020032312 National Inst. for Laser, Plasma and Radiation Pysics, Bucharest, Romania
Fast Pulsed X-Ray Sources Tightly Coupled with Small Targets for Isomer Triggering Studies ***Final Report***
GanciuPetcu, Mihai; Sep. 28, 2001; 11p; In English; Original contains color images
Contract(s)/Grant(s): F61775-00-WE061
Report No.(s): AD-A398179; EOARD-SPC 00-4061; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report results from a contract tasking National Institute for Laser, Plasma and Radiation Physics as follows: The contractor will develop a fast (less than 10 ns) compact pulsed X-ray source (spectrum energy end point greater than 20 KeV) which will allow synchronized detection of gamma rays from small isomer targets tightly coupled with the source.

DTIC

Pulse Generators; X Ray Sources; X Ray Tubes

20020032553 Norwegian Defence Research Establishment, Kjeller, Norway
On-Chip Memory Interface ***Integrert Sdram Minnegrensesnitt***
Gundersen, Rune, Norwegian Defence Research Establishment, Norway; Sep. 28, 2001; 216p; In Norwegian; Original contains color illustrations
Contract(s)/Grant(s): FFIE Proj. 726/170
Report No.(s): FFI/RAPPORT-2001/04586; ISBN 82-464-0549-7; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This report contains a description of an on-chip memory interface. The design is described in VHDL (VHSIC (very high speed integrated circuit) Hardware Description Language) language. The interface is fully tested and verified. Synthesis results for the Alcatel Mietec MTC45000 technology is presented.

Author

Hardware Description Languages; VHSIC (Circuits); Random Access Memory

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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.

20020027270 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA
A Century of Turbulence
Lumley, John L.; Yaglom, Akiva M.; Jan. 2000; 66p; In English
Contract(s)/Grant(s): N00014-01-1-0226
Report No.(s): AD-A398618; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This paper presents a summary of research on fluid dynamics over the past 100 years. From the very beginning, there have been two major threads in turbulence research. The first concerned the calculation of the practical effects of turbulence, primarily the momentum, heat and mass transfer, associated with the design of devices and their interaction with their environment. The other concerned the physics of the turbulence phenomenon. Both these threads were present in the initial work of Boussinesq and of Reynolds. They are still with us. The practical thread really was two threads, one is technological, and the other geophysical. The geophysical branch might well be called atmospheric and oceanic engineering, since it is motivated by a desire to calculate the effects of turbulence in order to predict the behavior of atmospheric and oceanic phenomena, in which turbulence is only one of many players. A fundamental desire to understand turbulence is not always a basic motivation.
DTIC
Fluid Dynamics; Turbulence Effects; Mass Transfer; Motivation

20020027280 NASA Ames Research Center, Moffett Field, CA USA
A New Theory of Nucleate Pool Boiling in Arbitrary Gravity
Buyevich, Y. A., NASA Ames Research Center, USA; Webbon, Bruce W., NASA Ames Research Center, USA; [1995]; 1p; In English; 2nd European Thermal-Sciences Conference, 29-31 May 1996, Rome, Rome, Italy, Italy; Sponsored by International Telecommunication Union, Unknown
Contract(s)/Grant(s): RTOP 199-61-62; No Copyright; Avail: Issuing Activity; Abstract Only

Heat transfer rates specific to nucleate pool boiling under various conditions are determined by the dynamics of vapour bubbles that are originated and grow at nucleation sites of a superheated surface. A new dynamic theory of these bubbles has been recently developed on the basis of the thermodynamics of irreversible processes. In contrast to other existing models based on empirically postulated equations for bubble growth and motion, this theory does not contain unwarrantable assumptions, and both the equations are rigorously derived within the framework of a unified approach. The conclusions of the theory are drastically different from those of the conventional models. The bubbles are shown to detach themselves under combined action of buoyancy and a surface tension force that is proven to add to buoyancy in bubble detachment, but not the other way round as is commonly presumed. The theory ensures a sound understanding of a number of so far unexplained phenomena, such as effect caused by gravity level and surface tension on the bubble growth rate and dependence of the bubble characteristics at detachment on the liquid thermophysical parameters and relevant temperature differences. The theoretical predictions are shown to be in a satisfactory qualitative and quantitative agreement with observations. When being applied to heat transfer at nucleate pool boiling, this bubble dynamic theory offers an opportunity to considerably improve the main formulae that are generally used to correlate experimental findings and to design boiling heat removal in various industrial applications. Moreover, the theory makes possible to pose and study a great deal of new problems of essential impact in practice. Two such problems are considered in detail. One problem concerns the development of a principally novel physical model for the first crisis of boiling. This model allows for evaluating critical boiling heat fluxes under various conditions, and in particular at different gravity levels, with a good agreement with experimental evidence. The other problem bears upon equilibrium shapes of a detached bubble near a heated surface in exceedingly low gravity. In low gravity or in weightlessness, the bubble can remain in the close vicinity of the surface for a long time, and its shape is greatly affected by the Marangoni effect due to both temperature and possible surfactant concentration being nonuniform along the interface. The bubble performs at these conditions like a heat pipe, with evaporation at the bubble lower boundary and condensation at its upper boundary, and ultimately ensures a substantial increase in heat removal as compared with that in normal gravity. Some other problems relevant to nucleate pool and forced convection boiling heat transfer are also discussed.
Author
Gravitation; Nucleate Boiling; Marangoni Convection; Forced Convection; Thermodynamics

20020027353 NASA Ames Research Center, Moffett Field, CA USA

Parallel CFD Algorithms for Aerodynamical Flow Solvers on Unstructured Meshes, Parts 1 and 2

Barth, Timothy J., NASA Ames Research Center, USA; [1995]; 1p; In English; Parallel Computing in Computational Fluid Dynamics, 15-19 May 1995, Brussels, Moffett Field, CA, Belgium, USA; Sponsored by NASA, USA

Contract(s)/Grant(s): RTOP 505-59-53; No Copyright; Avail: Issuing Activity; Abstract Only

The Advisory Group for Aerospace Research and Development (AGARD) has requested my participation in the lecture series entitled Parallel Computing in Computational Fluid Dynamics to be held at the von Karman Institute in Brussels, Belgium on May 15-19, 1995. In addition, a request has been made from the US Coordinator for AGARD at the Pentagon for NASA Ames to hold a repetition of the lecture series on October 16-20, 1995. I have been asked to be a local coordinator for the Ames event. All AGARD lecture series events have attendance limited to NATO allied countries. A brief of the lecture series is provided in the attached enclosure. Specifically, I have been asked to give two lectures of approximately 75 minutes each on the subject of parallel solution techniques for the fluid flow equations on unstructured meshes. The title of my lectures is ”Parallel CFD Algorithms for Aerodynamical Flow Solvers on Unstructured Meshes” (Parts I-II). The contents of these lectures will be largely review in nature and will draw upon previously published work in this area. Topics of my lectures will include: (1) Mesh partitioning algorithms. Recursive techniques based on coordinate bisection, Cuthill-McKee level structures, and spectral bisection. (2) Newton’s method for large scale CFD problems. Size and complexity estimates for Newton’s method, modifications for insuring global convergence. (3) Techniques for constructing the Jacobian matrix. Analytic and numerical techniques for Jacobian matrix-vector products, constructing the transposed matrix, extensions to optimization and homotopy theories. (4) Iterative solution algorithms. Practical experience with GIVIRES and BICG-STAB matrix solvers. (5) Parallel matrix preconditioning. Incomplete Lower-Upper (ILU) factorization, domain-decomposed ILU, approximate Schur complement strategies.

Author

Algorithms; Matrices (Mathematics); Newton Methods; Numerical Analysis; Vectors (Mathematics)

20020027463 NASA Ames Research Center, Moffett Field, CA USA

Anisotropic Structure of Rotating Homogeneous Turbulence at High Reynolds Numbers

Cambon, Claude, Ecole Centrale de Lyon, France; Mansour, Nagi N., NASA Ames Research Center, USA; Squires, Kyle D., Vermont Univ., USA; [1995]; 1p; In English

Contract(s)/Grant(s): RTOP 505-59-53; No Copyright; Avail: Issuing Activity; Abstract Only

Large eddy simulation is used to investigate the development of anisotropies and the evolution towards a quasi two-dimensional state in rotating homogeneous turbulence at high Reynolds number. The present study demonstrates the existence of two transitions in the development of anisotropy. The first transition marks the onset of anisotropy and occurs when a macro-Rossby number (based on a longitudinal integral lengthscale) has decreased to near unity while the second transition occurs when a micro-Rossby number (defined in this work as the ratio of the rms fluctuating vorticity to background vorticity) has decreased to unity. The anisotropy marked by the first transition corresponds to a reduction in dimensionality while the second transition corresponds to a polarization of the flow, i.e., relative dominance of the velocity components in the plane normal to the rotation axis. Polarization is reflected by emergence of anisotropy measures based on the two-dimensional component of the turbulence. Investigation of the vorticity structure shows that the second transition is also characterized by an increasing tendency for alignment between the fluctuating vorticity vector and the background angular velocity vector with a preference for corrotative vorticity.

Author

Anisotropy; High Reynolds Number; Homogeneous Turbulence; Rotation

20020027465 NASA Ames Research Center, Moffett Field, CA USA

Study of the Effect of Two-Dimensional Cavities on the Boundary Layer in an Adverse Pressure Gradient

Margason, Richard J., NASA Ames Research Center, USA; Platzer, Max F., Naval Postgraduate School, USA; [1995]; 1p; In English; 34th Aerospace Sciences Meeting and Exhibit, 15-18 Jan. 1996, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 505-59-53; No Copyright; Avail: Issuing Activity; Abstract Only

One concept for high lift aerodynamics is the trapped-vortex. Recently it has been suggested that several spoilers located at different chordwise locations on an airfoil could be deployed to form several cavities in the chordwise direction. This may provide a means of increasing upper surface camber and thereby increase wing lift. It is envisioned that the cavities would be located on an airfoil in its pressure recovery region. Investigations of the effect of one or more cavities on the adjacent boundary layer in an adverse boundary layer were not found in a literature survey. Since flow separation can be caused by flow over cavities, boundary layer measurements were made in the vicinity of cavities which were located in an adverse pressure gradient to study the associated

flow in an effort to identify any benefits. The experimental data from the present investigation indicate a minimal impact on the boundary layer profiles is caused by the presence of cavities in either a constant pressure freestream or an adverse pressure gradient. The data from the experimental investigation has been obtained and analyzed. The computational investigation using an incompressible Navier-Stokes code show that reasonable results are being obtained when they are compared with the experimental data.
Author
Boundary Layer Separation; Pressure Gradients; Aerodynamics; Cavities

20020027524 NASA Ames Research Center, Moffett Field, CA USA
Investigation Flow Uniformity in a Supersonic Duct with High Enthalpy Flows
Balboni, John, NASA Ames Research Center, USA; Atler, Doug, Calspan Corp., USA; Gokcen, Tahir, Eloret Corp., USA; [1995]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Flow uniformity in a high enthalpy facility is investigated. The scramjet research facility is composed of a rectangular combustor duct connected to a 100 MW electric arc air heater. The Mach 3.3 flow is accelerated through a two-dimensional contoured nozzle. Instream measurements were made with water-cooled Pitot probes and stagnation point heat flux gages at stream enthalpy levels ranging from 4 to 7 Mj/kg. Flow surveys were made on the flow centerline and off centerline in order to measure the three dimensional uniformity of the flow in the rectangular duct. Measurements indicated that although the flow in the aspect ratio 6:1 duct was relatively uniform on the centerline, three dimensional viscous effects were apparent near the corners. Flow through the nozzle and constant area duct was modeled computationally using a two dimensional, Navier-Stokes, reacting gas code. The computations predict that the flow in the test section is in vibrational equilibrium. The computed and measured Pitot pressure and heat flux profiles are in reasonable agreement with the experimental data.
Author
Flow Characteristics; Supersonic Speed; Enthalpy; Ducts; Test Chambers; Navier-Stokes Equation; Measuring Instruments

20020027525 NASA Ames Research Center, Moffett Field, CA USA
The Isolated Bubble Regime in Pool Nucleate Boiling
Buyevich, Y. A., NASA Ames Research Center, USA; Webbon, Bruce W., NASA Ames Research Center, USA; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 199-61-62; No Copyright; Avail: Issuing Activity; Abstract Only

We consider an isolated bubble boiling regime in which vapour bubbles are intermittently produced at a prearranged set of nucleation site on an upward facing overheated wall plane. In this boiling regime, the bubbles depart from the wall and move as separate entities. Except in the matter of rise velocity, the bubbles do not interfere and are independent of one another. However, the rise velocity is dependent on bubble volume concentration in the bulk. Heat transfer properties specific to this regime cannot be described without bubble detachment size, and we apply our previously developed dynamic theory of vapour bubble growth and detachment to determine this size. Bubble growth is presumed to be thermally controlled. Two limiting cases of bubble evolution are considered: the one in which buoyancy prevails in promoting bubble detachment and the one in which surface tension prevails. We prove termination of the isolated regime of pool nucleate boiling to result from one of the four possible causes, depending on relevant parameters values. The first cause consists in the fact that the upward flow of rising bubbles hampers the downward liquid flow, and under certain conditions, prevents the liquid from coming to the wall in an amount that would be sufficient to compensate for vapour removal from the wall. The second cause is due to the lateral coalescence of growing bubbles that are attached to their corresponding nucleation sites, with ensuing generation of larger bubbles and extended vapour patches near the wall. The other two causes involve longitudinal coalescence either 1) immediately in the wall vicinity, accompanied by the establishment of the multiple bubble boiling regime, or 2) in the bulk, with the formation of vapour columns. The longitudinal coalescence in the bulk is shown to be the most important cause. The critical wall temperature and the heat flux density associated with isolated bubble regime termination are found to be functions of the physical and operating parameters and are discussed in detail.
Author
Bubbles; Nucleate Boiling; Thermodynamic Properties; Heat Flux; Critical Temperature

20020027529 Thermoscience Inst., Moffett Field, CA USA
Numerical Simulations of High Enthalpy Pulse Facilities
Wilson, Gregory J., Thermoscience Inst., USA; [1995]; 1p; In English; 20th International Symposium on Shock Waves, 23-28 Jul. 1995, Pasadena, CA, USA
Contract(s)/Grant(s): NAS2-14031; RTOP 505-70-62; No Copyright; Avail: Issuing Activity; Abstract Only

Axisymmetric flows within shock tubes and expansion tubes are simulated including the effects of finite rate chemistry and both laminar and turbulent boundary layers. The simulations demonstrate the usefulness of computational fluid dynamics for characterizing the flows in high enthalpy pulse facilities. The modeling and numerical requirements necessary to simulate these flows accurately are also discussed. Although there is a large body of analysis which explains and quantifies the boundary layer growth between the shock and the interface in a shock tube, there is a need for more detailed solutions. Phenomena such as thermochemical nonequilibrium. or turbulent transition behind the shock are excluded in the assumptions of Mirels' analysis. Additionally there is inadequate capability to predict the influence of the boundary layer on the expanded gas behind the interface. Quantifying the gas in this region is particularly important in expansion tubes because it is the location of the test gas. Unsteady simulations of the viscous flow in shock tubes are computationally expensive because they must follow features such as a shock wave over the length of the facility and simultaneously resolve the small length scales within the boundary layer. As a result, efficient numerical algorithms are required. The numerical approach of the present work is to solve the axisymmetric gas dynamic equations using an finite-volume formulation where the inviscid fluxes are computed with a upwind TVD scheme. Multiple species equations are included in the formulation so that finite-rate chemistry can be modeled. The simulations cluster grid points at the shock and interface and translate this clustered grid with these features to minimize numerical errors. The solutions are advanced at a CFL number of less than one based on the inviscid gas dynamics. to avoid limitations on the time step due to the viscous terms, these terms are treated implicitly. This requires a block tri-diagonal matrix inversion along each line of cells normal to the wall. The cost of this inversion is more than offset by the larger allowable time step. The source terms representing the finite-rate chemical kinetics are also treated implicitly. An algebraic turbulence model for compressible flow is used. The flow in a low pressure shock tube is computed and the results are compared with Mirels'analysis. The driven gas is nitrogen at 70 Pa, and the incident shock speed is approximately 2.9 km/sec so that there is little dissociation. The simulations include a laminar boundary layer and are run until the limiting flow regime is achieved. At this limit, the shock and interface travel at the same velocity because the amount of driven gas between these two features remains the same: the mass flow across the shock is equal to the mass of gas being entrained at the interface by the boundary layer. Simulations with several grids are presented to establish the grid independence of the solution, Good agreement is achieved between Mirels' correlations and the computations. This is expected since the flow conditions are chosen to be consistent with the assumptions used in Mirels' analysis. This comparison adds credibility to the numerical approach and highlights some of the differences between the theory and the detailed simulations. In addition, simulations of the HYPULSE expansion tube are presented for two operating conditions and the computations are compared to experimental data. The operating gas for both cases is nitrogen. One test condition is at a total enthalpy of 15.2 MJ/Kg and a relatively low pressure of 2 kPa. This case is characterized by a laminar boundary layer and significant chemical nonequilibrium. in the acceleration gas. The second test condition is at a total enthalpy of 10.2 MJ/Kg and a pressure of 38 kPa and is characterized by a turbulent boundary layer. The simulations compare well with experiment and reveal that the nonuniformity in pressure observed during the test time is related to variations in the boundary layer displacement thickness.
Author

Mathematical Models; Numerical Analysis; Enthalpy; Axisymmetric Flow; Computational Fluid Dynamics

20020028164 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

A Numerical Investigation of Subsonic and Supersonic Flow Around Axisymmetric Bodies

Catalano, George D.; Sturek, Walter B., Sr; Sep. 2001; 62p; In English; Original contains color images

Contract(s)/Grant(s): DAAH04-93-G-0226

Report No.(s): AD-A398641; ARL-TR-2595; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A computational fluid dynamics (CFD) approach to predicting high-speed aerodynamic flow fields of interest to the US Army Research Laboratory (ARL) has been carried out. The aerodynamic problems of particular interest are: (1) supersonic flow past the aftbody of projectiles with base mass injection; (2) supersonic flow past the M549 projectile; and (3) subsonic, transonic, and supersonic flow past an M864 projectile with base bleed and wake combustion. The commercially available FLUENT CFD code was utilized. The computational effort supports an ongoing ARL-sponsored experimental investigation. of particular interest in the present investigation is the careful characterization of the various turbulence models employed in the CFD code. Additionally, the ease of use and set-up as well as the computational time will be described. An experimental effort consisting of detailed laser Doppler velocimeter (LDV), particle image velocimeter (PIV), and high-speed wall pressure measurements has been made in axisymmetric and planar subsonic and supersonic flows with embedded separated regions. The present work seeks to predict similar flow fields computationally and to address areas of agreement and disagreement.
DTIC

Axisymmetric Bodies; Computational Fluid Dynamics; Flow Distribution; Projectiles; Subsonic Flow; Supersonic Flow

20020028408 NASA Glenn Research Center, Cleveland, OH USA

The FCF Fluids Integrated Rack: Microgravity Fluid Physics Experimentation on Board the ISS

Gati, Frank G., NASA Glenn Research Center, USA; Hill, Myron E., NASA Glenn Research Center, USA; [2001]; 10p; In English; Conference and Exhibit on International Space Station Utilization 2001, 15-18 Oct. 2001, Cape Canaveral, FL, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 2001-4926; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Fluids Integrated Rack (FIR) is a modular, multi-user scientific research facility that will fly in the U.S. laboratory module, Destiny, of the International Space Station (ISS). The FIR will be one of the racks that will constitute the Fluids and Combustion Facility (FCF). The ISS will provide the FCF and therefore the FIR with the necessary resources, such as power and cooling, so that the FIR can carry out its primary mission of accommodating fluid physics science experiments. This paper discusses the mission, design, and the capabilities of the FIR in carrying out research on the ISS.

Author

Fluid Dynamics; Microgravity; Research Facilities

20020029721 NASA Glenn Research Center, Cleveland, OH USA

Numerical Simulation of Two Phase Flows

Liou, Meng-Sing, NASA Glenn Research Center, USA; [2001]; 13p; In English; International Symposium on Advanced Fluid Information, 3-5 Oct. 2001, Sendai, Japan; Sponsored by Tohoku Univ., Japan

Contract(s)/Grant(s): RTOP 708-87-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two phase flows can be found in broad situations in nature, biology, and industry devices and can involve diverse and complex mechanisms. While the physical models may be specific for certain situations, the mathematical formulation and numerical treatment for solving the governing equations can be general. Hence, we will require information concerning each individual phase as needed in a single phase. but also the interactions between them. These interaction terms, however, pose additional numerical challenges because they are beyond the basis that we use to construct modern numerical schemes, namely the hyperbolicity of equations. Moreover, due to disparate differences in time scales, fluid compressibility and nonlinearity become acute, further complicating the numerical procedures. In this paper, we will show the ideas and procedure how the AUSM-family schemes are extended for solving two phase flows problems. Specifically, both phases are assumed in thermodynamic equilibrium, namely, the time scales involved in phase interactions are extremely short in comparison with those in fluid speeds and pressure fluctuations. Details of the numerical formulation and issues involved are discussed and the effectiveness of the method are demonstrated for several industrial examples.

Author

Direct Numerical Simulation; Computational Fluid Dynamics; Two Phase Flow; Upwind Schemes (Mathematics)

20020029843 Los Alamos National Lab., NM USA

Applicability of unimodal stochastic approaches in simulating flow in bimodal heterogeneous formations

Lu, Z.; Zhang, D.; Keating, E.; Aug. 01, 2001; 12p; In English

Report No.(s): DE2001-784539; LA-UR-01-4727; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Most existing stochastic models assume that the porous medium being studied can be characterized by one single correlation scale. However, hydraulic properties exhibit spatial variations at various scales, thus stochastic models developed for unimodal media may not be applicable to flow and transport in a bimodal heterogeneous medium. The aim of this study is to investigate under what circumstances the second-order moment-based stochastic models are applicable to the bimodal porous medium. We assume that two materials (categories) in the porous medium may have a different mean, variance, and correlation scale. The distribution of materials in the domain is characterized by indicator random variables and that of the composite field in terms of categorical proportions and transition probability. We solved the second-order flow moment equations for the 'equivalent' unimodal field with an exponential covariance of a single correlation scale computed for the composite field. On the other hand, we conduct two sets of Monte Carlo simulations: one with bimodal random fields and the other with equivalent unimodal fields. Numerical experiments show that a bimodal InK field may be well approximated with an equivalent unimodal field when the bimodal distribution is highly asymmetric, under which condition the applicability of the second-order moment-based stochastic model is subject to the same limitation of relatively small variances as that for unimodal fields. When the bimodal distribution is symmetric, although it cannot be adequately represented by an equivalent unimodal distribution the second-order moment-based stochastic model seems to be applicable to larger composite variance systems than it does for an asymmetric distribution.

NTIS

Transition Probabilities; Distribution Moments; Covariance; Heterogeneity; Flow Equations

20020030079 Los Alamos National Lab., NM USA

Invariant functional forms for k(p,p) type equations of state for hydrodynamically driven flow

Hrbek, G.; Jun. 01, 2001; 5p; In English

Report No.(s): DE2001-783303; LA-UR-01-3184; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A complete Lie group analysis of the general ID hydrodynamic flow problem for a general K(p,P) type equation of state is presented. Since many equations of state (e.g., Vinet, Birch-Murnaghan, Shaker, ant Tait) are of this form, one can use the techniques presented here to study their behavior. Making use of the full transformation group, the hyperbolic conservation laws for mass, momentum, and energy reduce to non-linear, ordinary differential equations. These equations describe the density, particle velocity, and pressure behind the shock as functions of the shock from Mach number. Note that unlike the classical result that defines the flow only at the strong shock limit, in this analysis the Mach number is allowed to be one or greater. This allows the behavior of a shocked material to be described down to the acoustic limit. This technique is illustrated using the Tait EOS for a shock moving through NaC1. Finally, the ratios of the group parameters are shown to have definite physical meanings defined in terms of the equation of state and the physical conditions occurring during the event that has produced the shock wave.

NTIS

Hydrodynamics; Shock Waves; Computer Programs; Lie Groups; Conservation Laws

20020030353 Los Alamos National Lab., NM USA

Physical interpretation of mathematically invarient k(r,p) type equations of state for hydrodynamically driven flow

Hrbek, G. M.; Jun. 01, 2001; 5p; In English

Report No.(s): DE2001-783337; LA-UR-01-3347; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In order to apply the power of a full group analysis to the problem of an expanding shock in planar, cylindrical, and spherical geometries, the expression for the shock front position R (t) has been modified to allow the wave to propagate through a general non-uniform medium. This representation incorporates the group parameter ratios as meaningful physical quantities and reduces to the classical Sedov-Taylor solution for a uniform media. Expected profiles for the density, particle velocity, and pressure behind a spherically diverging shock wave are then calculated using the Tait equation of state for a moderate (i.e., 20 t TNT equivalent) blast load propagating through NaC1. The changes in flow variables are plotted for Mach is less than 1.5. Finally, effects due to variations in the material uniformity are shown as changes in the first derivative of the bulk modulus (i.e., Ko').

NTIS

Hydrodynamics; Blast Loads; Supersonic Speed; Shock Fronts; Cylindrical Bodies; Equations of State

20020030746 Analytical Services and Materials, Inc., Hampton, VA USA

Transition Documentation on a Three-Element High-Lift Configuration at High Reynolds Numbers: Analysis

Bertelrud, Arild, Analytical Services and Materials, Inc., USA; February 2002; 259p; In English

Contract(s)/Grant(s): NAS1-96014; RTOP 706-31-11-80

Report No.(s): NASA/CR-2002-211438; NAS 1.26:211438; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

A 2-D high-lift system experiment was conducted in August of 1996 in the Low Turbulence Pressure Tunnel at NASA Langley Research Center, Hampton, VA. The purpose of the experiment was to obtain transition measurements on a three element high-lift system for CFD code validation studies. A transition database has been created using the data from this experiment. The present report contains the analysis of the surface hot film data in terms of the transition locations on the three elements. It also includes relevant information regarding the pressure loads and distributions and the wakes behind the model to aid in the interpretation of the transition data. For some of the configurations the current pressure data has been compared with previous wind tunnel entries of the same model. The methodology used to determine the regions of transitional flow is outlined and each configuration tested has been analyzed. A discussion of interference effects, repeatability, and three-dimensional effects on the data is included.

Author

Aerodynamic Configurations; Computational Fluid Dynamics; Transition Flow; Wind Tunnel Tests; Boundary Layer Transition; Hot-Film Anemometers

20020030832 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

The Century of Turbulence Theory: The Main Achievements and Unsolved Problems

Jan. 2001; 61p; In English

Contract(s)/Grant(s): N00014-01-1-0226

Report No.(s): AD-A398709; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The flows of fluids actually met both in nature and engineering practice are turbulent in the overwhelming majority of cases. Therefore, in fact the humanity began to observe the turbulence phenomena at the very beginning of their existence. However only much later some naturalists began to think about specific features of these phenomena. and not less than 500 years ago the first attempts of qualitative analysis of turbulence appeared - about 1500 - Leonardo da Vinci again and again observed, described and sketched diverse vortical formations (coherent structures' according to the terminology of the second half of the 20th century) in various natural water streams. In his descriptions this remarkable man apparently for the first time used the word turbulence (in Italian la turbolenza, originating from Latin turba meaning turmoil) in its modern sense and also outlined the earliest version of the procedure similar to that now called the Reynolds decomposition of the flow-fields into regular and random parts. However, original Leonardo's studies did not form a theory in the modern meaning of this word. Moreover, he published nothing during all his life and even used in most of his writings a special type which could be read only in a mirror.
DTIC
Flow Distribution; Qualitative Analysis; Turbulence; Fluid Flow

20020030834 Naval Undersea Warfare Center, Newport, RI USA
Stokes' Mechanism of Drag Reduction
Bandyopadhyay, Promode R.; Oct. 15, 2001; 29p; In English
Contract(s)/Grant(s): N00014-99-WX-30295
Report No.(s): AD-A398719; NUWC-NPT-TR-11; 316; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The mechanism of drag reduction due to span wise wall oscillation in a turbulent boundary layer is considered in this report. Published measurements and simulation data are analyzed in light of Stokes' second problem. A kinematic vorticity reorientation hypothesis of drag reduction is first developed. It is shown that span wise oscillation seeds the near-wall region with oblique and skewed Stokes' vorticity waves. They are attached to the wall and gradually align to the free stream direction away from it. The resulting Stokes' layer has an attenuated nature compared to its laminar counterpart. The attenuation factor increases in the buffer and viscous sublayer as the wall is approached. The mean velocity profile at the condition of maximum drag reduction is similar to that due to polymer. The final mean state of maximum drag reduction due to turbulence suppression appears to be universal in nature. Finally, it is shown that the proposed kinematic drag reduction hypothesis describes the measurements significantly better than the current direct numerical simulation method.
DTIC
Drag Reduction; Kinematics; Turbulent Boundary Layer

20020030835 Naval Undersea Warfare Center, Newport, RI USA
Electromagnetic Turbulence Control: Salt Water Experiments on an Axisymmetric Body
Bandyopadhyay, Promide R.; CAstano, John M.; Nedderman, William H.; Thivierge, Daniel P.; Stupak, Joseph; Oct. 15, 2001; 60p; In English; Original contains color images
Report No.(s): AD-A398717; NUWC-NPT-TR-11; 317; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The control of turbulence in a turbulent boundary layer developing over a small axisymmetric cylindrical body in salt water at a moderate Reynolds number is considered in this report. Because near-wall turbulence production has a quasicyclic nature, an attempt is made to perturb the process by means of a periodic Lorenz force. A method of measuring the change in drag due to applied perturbations on a floating cylinder immersed in electrically charged salt water has been developed, and laser Doppler velocimetry measurements of changes in the near-wall mean velocity and turbulence have been carried out. Wall-pressure measurements have also been carried out to determine the effects of perturbation. The skewness and kurtosis of the wall-pressure fluctuation signal were found to increase slowly with the frequency of the Lorenz power pulsing to the microtiles. This pulsing leads to an amplification of wall-pressure spectrum power, which, although weak, provides support to the wall-layer resonance mechanism of the proposed microtiles.
DTIC
Axisymmetric Bodies; Perturbation; Pressure Measurement; Turbulence; Turbulent Boundary Layer; Wall Pressure; Axisymmetric Flow

20020031144 NASA Glenn Research Center, Cleveland, OH USA

Modeling the Restraint of Liquid Jets by Surface Tension in Microgravity

Chato, David J., NASA Glenn Research Center, USA; Jacqmim, David A., NASA Glenn Research Center, USA; [2001]; 18p; In English; 39th AIAA Aerospace Sciences Meeting and Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 713-81-30

Report No.(s): AIAA Paper 2001-0931; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

An axisymmetric phase field model is developed and used to model surface tension forces on liquid jets in microgravity. The previous work in this area is reviewed and a baseline drop tower experiment selected 'for model comparison. A mathematical model is developed which includes a free surface. a symmetric centerline and wall boundaries with given contact angles. The model is solved numerically with a compact fourth order stencil on a equally spaced axisymmetric grid. After grid convergence studies, a grid is selected and all drop tower tests modeled. Agreement was assessed by comparing predicted and measured free surface rise. Trend wise agreement is good but agreement in magnitude is only fair. Suspected sources of disagreement are suspected to be lack of a turbulence model and the existence of slosh baffles in the experiment which were not included in the model.

Author

Fluid Jets; Interfacial Tension; Microgravity; Axisymmetric Flow; Mathematical Models

20020031754 Massachusetts Inst. of Tech., Cambridge, MA USA

Statistical Fluid Mechanics: The Mechanics of Turbulence

Monin, A. S.; Yaglom, A. M.; Sep. 1999; 202p; In English

Report No.(s): AD-A398728; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Statistical Fluid Mechanics: The Mechanics of Turbulence is presented in this paper.

DTIC

Statistical Mechanics; Turbulence; Fluid Dynamics

20020032298 NASA Glenn Research Center, Cleveland, OH USA

Experimental Investigation of 'Transonic Resonance' with Convergent-Divergent Nozzles

Zaman, K. B. M. Q., NASA Glenn Research Center, USA; Dahl, M. D., NASA Glenn Research Center, USA; Bencic, T. J., NASA Glenn Research Center, USA; [2001]; 26p; In English; 39th AIAA Aerospace Sciences Meeting & Exhibit, 8-11 Jan. 2001, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 708-90-43

Report No.(s): AIAA Paper 2001-0078; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Convergent-divergent nozzles, when run at pressure ratios lower than the design value, often undergo a flow resonance accompanied by the emission of acoustic tones. The phenomenon, different in characteristics from conventional 'screech' tones, has been studied experimentally. Unlike screech, the frequency increases with increasing supply pressure. There is a 'staging' behavior; 'odd harmonic' stages resonate at lower pressures while the fundamental occurs in a range of higher pressures corresponding to a fully expanded Mach number (M(sub j)) around unity. The frequency (f(sub N)) variation with M(sub j) depends on the half angle-of-divergence (theta) of the nozzle. At smaller theta, the slope of f(sub N) versus M(sub j) curve becomes steeper. The resonance involves standing waves and is driven by unsteady shock/boundary layer interaction. The distance between the foot of the shock and the nozzle exit imposes the lengthscale (L'). The fundamental corresponds to a quarterwave resonance, the next stage at a lower supply pressure corresponds to a three-quarter-wave resonance, and so on. The principal trends in the frequency variation are explained simply from the characteristic variation of the length-scale L'. Based on the data, correlation equations are provided for the prediction of f(sub N). A striking feature is that tripping of the boundary layer near the nozzle's throat tends to suppress the resonance. In a practical nozzle a tendency for the occurrence of the phenomenon is thought to be a source of 'internal noise'; thus, there is a potential for noise benefit simply by appropriate boundary layer tripping near the nozzle's throat.

Author

Convergent-Divergent Nozzles; Acoustic Frequencies; Mach Number; Sound Waves; Acoustic Resonance

20020032318 Pennsylvania State Univ., Applied Research Lab., University Park, PA USA

Development and Validation of a Stochastic Model for the Hydrodynamic Forcing Function from Submarine Propulsors and Appendages ***Final Report, 1 Apr. 1999-31 Mar. 2001***

Peltier, Leonard J.; Jan. 23, 2002; 17p; In English; Original contains color images

Contract(s)/Grant(s): N00014-99-0588

Report No.(s): AD-A398743; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The long-term objective of this research was to develop a stochastic model for the two-point surface-pressure correlation and the related surface-pressure spectrum that uses RANS data as input. The model would have given a complete hydrodynamic forcing function for structural acoustics applications. The use of Reynolds-Averaged Navier-Stokes data as input to the model allowed the model to respond to local flow and configuration complications through the RANS modeling. Contemporary experience with RANS shows clearly that it can predict mean-field statistics for Navy applications with reasonable fidelity. The method is first-principles-based and is expected to be valid for evaluation of new designs, ones with no already accumulated experimental database.

DTIC

Fluid Flow; Stochastic Processes; Product Development; Proving; Mathematical Models

20020032616 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA

The Investigation of Hypervelocity Gouging ***Final Report, Jul. 2000-Dec. 2001***

Laird, David J.; Mar. 01, 2002; 199p; In English

Report No.(s): AD-A398636; AFIT/DS/ENY/02-01; No Copyright; Avail: Defense Technical Information Center (DTIC)

The slipper/rail interface of a hypervelocity rocket sled is subject to immense forces due to dynamic loads and impact of the slipper with the rail, and tremendous heating due to aerodynamic and frictional effects is produced at the interface. Under these severe loading conditions, the material in the rail will sometimes experience large non-linear deformations known as gouging. Hydrocodes are computational solvers designed to handle such non-linear, large deformation, high shock, hydrodynamic applications. The ability of the hydrocode CTH to handle gouge modeling is considered, as well as the manner in which temperature environments affect deformation and plastic strain. The solution techniques and material modeling are described. Using this numerical analysis tool, a study of how gouging occurs and tracing of its development at various impact velocities was undertaken, with emphasis on the effect of shock wave distribution. Modeling the intense aerodynamic and frictional heating near the contact region, the effects of temperature on gouge initiation were evaluated through the application of several thermal environment scenarios that have been developed. The effects of friction, slipper geometry, slipper velocity, and impact method have been considered. Finally, the differences between three-dimensional and two-dimensional analysis considering gouging have been evaluated.

DTIC

High Speed; Deformation; Rocket Propelled Sleds; Friction; Numerical Analysis

20020032694 Computer Sciences Corp., USA

CFD Data Sets on the WWW for Education and Testing

Globus, Al, Computer Sciences Corp., USA; [1995]; 6p; In English; 6th International Symposium, Sep. 1995, Tahoe, CA, USA

Contract(s)/Grant(s): NAS2-12961; RTOP 536-01-50; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Numerical Aerodynamic Simulation (NAS) Systems Division at NASA Ames Research Center has begun the development of a Computational Fluid Dynamics (CFD) data set archive on the World Wide Web (WWW) at URL http://www.nas.nasa.gov/NAS/DataSets/. Data sets are integrated with related information such as research papers, metadata, visualizations, etc. In this paper, four classes of users are identified and discussed: students, visualization developers, CFD practitioners, and management. Bandwidth and security issues are briefly reviewed and the status of the archive as of May 1995 is examined. Routine network distribution of data sets is likely to have profound implications for the conduct of science. The exact nature of these changes is subject to speculation, but the ability for anyone to examine the data, in addition to the investigator's analysis, may well play an important role in the future.

Author

Computational Fluid Dynamics; Computerized Simulation; Data Management; World Wide Web; Data Bases

20020033019 NASA Ames Research Center, Moffett Field, CA USA

Reynold-Number Effects on Near-Wall Turbulence

Mansour, N. N., NASA Ames Research Center, USA; Kim, J., California Univ., USA; Moser, R. D., Illinois Univ. at Urbana-Champaign, USA; [1995]; 1p; In English; Sixth International Symposium on Computational Fluid Dynamics, 4-8 Sep.

1995, Lake Tahoe, NV, Irvine, CA, USA, USA; Sponsored by American Physical Society, USA
Contract(s)/Grant(s): RTOP 505-59-53; No Copyright; Avail: Issuing Activity; Abstract Only

The Reynolds stress budget in a full developed turbulent channel flow for three Reynolds numbers (Re = 180,395,590) are used to investigate the near wall scaling of various turbulence quantities. We find that as the Reynolds number increases, the extent of the region where the production of the kinetic energy is equal to the dissipation increases. At the highest Reynolds number the region of equilibrium extends from y+ - 120 to y+ = 240. As the Reynolds number increases, we find that wall scaling collapses the budgets for the streamwise fluctuating component, but the budgets for the other two components show Reynolds number dependency.

Author

Reynolds Number; Reynolds Stress; Wall Flow; Turbulent Flow

35
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.

20020027221 Arizona Univ., Tucson, AZ USA

Mid-Wave Infrared Camera for High Speed Hyperspectral Imaging ***Final Report, 31 Mar. 2000-30 Sep. 2001***

Sabatke, Derek; Dereniak, Eustace; Garcia, John; Sep. 2001; 4p; In English

Contract(s)/Grant(s): DAAD19-00-1-0098

Report No.(s): AD-A398497; FRS-321220; ARO-40683.1-PH-RIP; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The MWIR imaging system acquired under the DURIP grant was incorporated into a rotating compensator imaging polarimeter. In such systems, several images of the target scene are captured through a retarder and analyzer, with the retarder rotated to a different orientation for each image. With each retarder position, the system is sensitive to a different polarization state at the input. by collecting data with the retarder in several positions, the entire polarization state of the light entering the system can be reconstructed. Since the polarimeter in question is an imaging instrument, a polarization state is reconstructed at every pixel of the scene.

DTIC

Infrared Radiation; High Speed Cameras; Polarimeters; Imaging Techniques

20020027231 Naval Research Lab., Washington, DC USA

Offshore Surface Surveillance with HF Radar

Hendrick, James M.; Nov. 16, 2001; 10p; In English

Report No.(s): AD-A398493; NRL/MR/5320-01-8590; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

High frequency (HF) groundwave radars are routinely deployed for ocean roughness and current monitoring. These low-powered radars see ship traffic as annoyance echoes, and they employ filtering techniques to remove ship and boat echoes. A simple processor addition to such radars could provide surface target tracks out to the tens of miles distances. Neptune in the UK and the Moscow Institute of Long-Wave Radiowave Communications offer radars for harbor management and monitoring coastal traffic. In this report, the performance of HF groundwave radar for surface targets is predicted for over the sea paths. The radar antenna location is taken to be at the shoreline and well coupled to a sea with typical ocean salinity. The radar parameters selected are easily achieved. The nominal 10 MHz operating frequency is a compromise between large antenna size required by low frequency operation and higher path losses experienced at higher frequencies. A transmitter average power of 1 kW 30 dBw and a transmitter-receiver antenna gain product of 30 dBi are selected; these values are somewhat less than were suggested in a sales brochure. At square-meter target yields a 20 dB signal to noise ratio (SNR) at 40 nm. At slow speeds, the target can be obscured by the sea echo (dependent upon the spatial resolution cell size); this emphasizes that for small targets, resolution cell size is more important than energy density. Under relatively calm conditions, the target would be detectable at all speeds except zero, where the target might be obscured by land returns from antenna side lobes.

DTIC

High Frequencies; Targets; Radar; Surveillance

20020027250 Southern Methodist Univ., Dept. of Electrical Engineering, Dallas, TX USA

GOALI: Systems Integration of Uncooled YBaCuO IR Detectors ***Final Report***

Butler, Donald P.; Celik-Butler, Zeynep; Nov. 30, 2001; 46p; In English

Report No.(s): AD-A398313; ARO-38673.19-PH; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Infrared imaging has demonstrated itself as a vital aspect of modern weapons systems. Infrared (IR) imaging has the potential to play an equally important role in commercial applications in medicine and transportation. Automobiles equipped with infrared imaging capabilities have been envisioned for the near future. This technology has the potential to tremendously improve personal safety by enabling good vision at night and under adverse weather conditions. Infrared imagers in automobiles may also be an enabling technology for 'intelligent super-highways'. However, IR imaging systems currently used by the military are too costly for consumer applications. This necessitates the development of inexpensive, uncooled infrared imaging systems that possess high detectivity for night vision applications. This research investigated the integration of semiconducting YBaCuO into micromachined thermal isolation structures to produce uncooled infrared detectors. Various detector structures were developed including a self-supporting structure where the 300 to 400-nm-thick thin film YBaCuO thermometer was held above the substrate by its electrode arms producing a detector with very low thermal mass (as low as 2.3 nl/K) while maintaining an absorption of 30%. Also dual microcavity detectors were developed for to produce a relatively flat spectral response over a large optical bandwidth.

DTIC

Imaging Techniques; Infrared Detectors; Infrared Imagery; Systems Integration; YBCO Superconductors

20020027475 Brookhaven National Lab., Upton, NY USA

Optically based charge injection system for ionization detectors

Chen,; Citterio,; Lanni,; Leite,; Radeka,; Sep. 11, 2001; 4p; In English

Report No.(s): DE2001-789359; BNL-68716; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An optically coupled charge injection system for ionization based radiation detectors which allows a test charge to be injected without the creation of ground loops has been developed. An ionization like signal from an external source is brought into the detector through an optical fiber and injected into the electrodes by means of a photodiode. As an application example, crosstalk measurements on a liquid Argon electromagnetic calorimeter readout electrodes were performed.

NTIS

Photodiodes; Radiation Detectors; Charge Injection Devices; Electromagnetism

20020027703 National Inst. of Standards and Technology, Office of Weights and Measures Program, Gaithersburg, MD USA

Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices as Adopted by the 86th National Conference on Weights and Measures, 2001. 2002 Edition

Butcher, T. G.; Grimes, T. L.; Suiter, R.; Williams, J.; Nov. 2001; 314p; In English

Report No.(s): PB2002-101066; NIST/HB-44/2002; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

Handbook 44 was first published in 1949, having been preceded by similar handbooks of various designations and in several forms. This 2002 edition was developed by the Committee on Specifications and Tolerances of the National Conference on Weights and Measures with the assistance of the Office of Weights and Measures of the National Institute of Standards and Technology. It includes amendments adopted by the 86th Annual Meeting of the National Conference on Weights and Measures in 2001. Handbook 44 is published in its entirety each year following the Annual Meeting of the National Conference on Weights and Measures.

NTIS

Conferences; Handbooks; Weight Measurement; Measuring Instruments

20020028800 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Nonvolatile Rad-Hard Holographic Memory

Chao, Tien-Hsin, Jet Propulsion Lab., California Inst. of Tech., USA; Zhou, Han-Ying, Jet Propulsion Lab., California Inst. of Tech., USA; Reyes, George, Jet Propulsion Lab., California Inst. of Tech., USA; Dragoi, Danut, Jet Propulsion Lab., California Inst. of Tech., USA; Hanna, Jay, Jet Propulsion Lab., California Inst. of Tech., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 12-17; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We are investigating a nonvolatile radiation-hardened (rad-hard) holographic memory technology. Recently, a compact holographic data storage (CHDS) breadboard utilizing an innovative electro-optic scanner has been built and demonstrated for high-speed holographic data storage and retrieval. The successful integration of this holographic memory breadboard has paved

the way for follow-on radiation resistance test of the photorefractive (PR) crystal, Fe:LiNbO3. We have also started the investigation of using two-photon PR crystals that are doubly doped with atoms of iron group (Ti, Cr, Mn, Cu) and of rare-earth group (Nd, Tb) for nonvolatile holographic recordings.
Author
Breadboard Models; Holography; Memory (Computers); Radiation Hardening; Data Storage

20020028885 NASA Glenn Research Center, Cleveland, OH USA
Phase-Shifting Shearing Interferometer
Griffin, DeVon W., NASA Glenn Research Center, USA; Optics Letters; Feb. 01, 2001; ISSN 0146-9592; Volume 26, No. 3, pp. 140-141; In English
Contract(s)/Grant(s): NAG3-2348; RTOP 101-53-00; Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
A single-element phase-shifting interferometer has been developed based on the lateral shearing interferometer. This new interferometer requires no precise alignment, and the phase is continuously varied by changes in the voltage across a commercially available liquid-crystal phase retarder.
Author
Interferometers; Phase Shift

20020030262 Naval Postgraduate School, Monterey, CA USA
Measurements and Modeling Enhancements for the NPS Minimum Resolvable Temperature Difference Model, VISMODII
Celik, Mustafa; Sep. 2001; 194p; In English
Report No.(s): AD-A397426; No Copyright; Avail: Defense Technical Information Center (DTIC)
Minimum Resolvable Temperature Difference (MRTD) measurement has long been used to describe the performance of thermal imaging systems. Computer models such as US Army's FLIR92 (forward looking infrared), that were developed to predict the MRTD, were reported to have deficiencies in dealing with sampling and aliasing effects. The models also include assumptions regarding the observer recognition process and therefore cannot predict the MRTD of an imager that incorporates an 'objective' automatic target recognition device instead of a 'subjective' human observer. The Visibility Model II developed for second generation thermal imaging systems at the Naval Postgraduate School (NPS) in the mid 1990s takes sampling and aliasing issues into account and makes no assumptions about the observer. Modeling enhancements in VISMODII and its extension to predict objective MRTD are proposed and tested in this thesis. A parallel thesis at the NPS has shown that aliasing effects on image appearance are fundamentally different from noise. The improved VISMODII model accounts for the fact that unlike noise, aliasing may have a visual enhancing effect and therefore may lower MRTD. Experiments were conducted to measure subjective and objective MRTD. Experimental results demonstrated that the VISMODII model successfully predicts the MRTD both for the subjective and the objective schemes.
DTIC
Computer Programs; FLIR Detectors; Infrared Imagery

20020030817 Air Force Research Lab., Munitions Directorate, Eglin AFB, FL USA
Application of Optic Flow to Missiles
Pendleton, Ryan; Apr. 25, 2001; 17p; In English; Original contains color images; Papers from "Workshop on Precision Guidance of Small Diameter Missiles", 25 & 26 April 2001, SR-RD-MG-01-05, From 25 Apr 2001 to 26 Apr 2001. --Original contains color plates: All DTIC reproductions will be in black and white. Contains viewgraphs onl
Report No.(s): AD-A397228; No Copyright; Avail: Defense Technical Information Center (DTIC)
The background is as follows: Why investigate optic flow? Optic Flow (OF) definition; Review of current OF efforts; Specific challenges for missile application; Goals for AFRL (Air Force Research Laboratory)/MN (Munitions) effort.
DTIC
Optical Equipment; Global Positioning System; Inertial Navigation; Missiles

20020030828 Alphatech, Inc., Burlington, MA USA
All-Source Track and Identity Fusion
Coraluppi, Stefano; Carthel, Craig; Luettgen, Mark; Lynch, Susan; Jun. 2000; 18p; In English
Report No.(s): AD-A398379; No Copyright; Avail: Defense Technical Information Center (DTIC)
This work addresses the association of moving-target indicator (MTI) tracks, EO and SAR imagery (IMINT) tracks, and signal intelligence (SIGINT) tracks, and the fusion of the corresponding report-level kinematic and identity information. Our

fusion algorithm is based on hypothesis-management logic which recursively processes incoming frames of data from upstream trackers. The logic includes hypothesis generation, scoring, and pruning components. These components are based on track information, kinematic-state information, and vehicle identity information. Key track-level performance metrics for our fusion algorithm include the probability of correct track-to-track association and track fragmentation. We study the performance of the algorithm with simulated single-sensor tracks, for two scenarios of interest. The first scenario is based on a data collection for a set of 30 GPS-equipped targets, while the second is based on simulated ground truth for a set of 8 scattering targets.
DTIC
Moving Target Indicators; Synthetic Aperture Radar; Tracking (Position); Algorithms; Fusion

20020031248 California Inst. of Tech., Pasadena, CA USA
HFI Bolometer Detectors Programmatic CDR ***Final Report, 1 Nov. 1997 - 31 Jul. 2001***
Lange, Andrew E., California Inst. of Tech., USA; [2002]; 22p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG5-6573; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Programmatic Critical Design Review (CDR) of the High Frequency Instrument (HFI) Bolometer Detector on the Planck Surveyor is presented. The topics include: 1) Scientific Requirements and Goals; 2) Silicon Nitride Micromesh 'Spider-Web' Bolometers; 3) Sub-Orbital Heritage: BOOMERANG; 4) Noise stability demonstrated in BOOMERANG; 5) Instrument Partners; 6) Bolometer Environment on Planck/HFI; 7) Bolometer Modules; and 8) Mechanical Interface. Also included are the status of the receivables and delivery plans with Europe. This paper is presented in viewgraph form.
CASI
Bolometers; Design Analysis; High Frequencies; Mechanical Engineering; Detectors; Fabrication

20020032231 Honeywell, Inc., Sensors and Guidance Products, Minneapolis, MN USA
See-Through Turret Visualization Program ***Final Report***
Belt, Ronald A.; Riddle, KLarry R.; Jan. 2002; 130p; In English; Prepared in cooperation with Sarnoff Corp., Princeton, NJ 08543
Contract(s)/Grant(s): DAAN02-98-C-4034
Report No.(s): AD-A398893; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A combat vehicle visualization system was developed to enhance situational awareness of a vehicle commander. The system has a 3600 panoramic sensor, gimbaled infrared sensor, and helmet-mounted display (HMD). The HMD-displayed sensor data can aid the commander in vehicle maneuvering and threat acquisition while the vehicle is buttoned up. The HMD-displayed Force XXI Battle Command Brigade and Below (FBCB2) information can aid the commander in receiving orders and sending situation reports while standing in the hatch. A system requirements document based on interviews with armored vehicle commanders was created. Trade studies were performed to arrive at a system approach to meet the established requirements. Next, a development specification was created for a prototype system using existing sensor and display components to demonstrate the system features. A prototype system was assembled and demonstrated on a High Mobility Multipurpose Wheeled Vehicle (HMMWV). It was also exhibited at the CY2000 Fort Knox Armor Conference and the CY2000 AUSA show. The results show the system can provide the sensor and FBCB2 information required by the commander, and is robust enough tested on moving armored vehicles. A deployable System can enhance a commander's performance on armored vehicles (Abrams, Bradley, Future Combat System (FCS)).
DTIC
Helmet Mounted Displays; Situational Awareness; Infrared Detectors; Tanks (Combat Vehicles)

20020032620 Defence Research Establishment Ottawa, Ottawa, Ontario Canada
Comparison of Radiation Response of LiF:MgCuP and A12O3:C Thermoluminescent Dosimeters
Erhardt, L. S.; Prud'homme-Lalonde, L.; Cousins, T.; Estan, D.; Hoffarth, B.; Oct. 2001; 39p; In English
Report No.(s): AD-A398904; DREO-TM-2001-074; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study was conducted comparing the properties of two types of thermoluminescent dosimeters (TLDs): LiF:MgCuP (TLD-100H) and Al2O3:C (TLD-500). This was done in order to determine which is better suited for the dosimetry requirements of the Radiation Effects (RE) Group at DREO (Defense Research Establishment Ottawa) (RE/DREO). The dose and energy response of the TLDs were measured by exposing them to a wide range of photon doses and energies. In addition, the sensitivity of the TLDs to fast and thermal neutrons was determined with a PuBe source. Fading and background detection were also studied. The TLD-100H dosimeter was found to be slightly more tissue-equivalent in its energy response but the TLD-500 spanned a larger dose range. In addition, TLD-500 had a desirable insensitivity to thermal neutrons. The effect of fading and response to

background were similar in the two types of TLD. The TLD-500 dosimeter was found to be better suited to the environments employed by the RE/DREO.
DTIC
Thermoluminescence; Dosimeters

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.

20020027248 State Univ. of New York, Office of Research Services, Stony Brook, NY USA
Design and Implementation of High Power Pulse Operation Broadened Waveguide 1.5 micrometer InGaAsP/InP MQW Lasers ***Final Report, 1 Apr. 1999-30 Sep. 2001***
Belenky, Gregory; Sep. 2001; 4p; In English
Contract(s)/Grant(s): DAAD19-99-1-0122
Report No.(s): AD-A398335; ARO-39809.1-PH; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Broad stripe 1.5-micrometer InGaAsP/InP MQW graded index SCH lasers with different waveguide widths and doping profiles were designed, fabricated, and characterized. Studies of the characteristics of lasers with different p-doping profiles as well as modeling data show that the heterobarrier electron leakage is responsible for the effect of optical power saturation with current. Broadened waveguide devices containing higher Zn concentration in the vicinity of p-cladding/SCH interface yielded maximum output optical pulsed power density giving more than 1 W from l00 micrometers aperture. Direct measurements of optical loss for BW lasers with different doping profiles have shown that doping can increase the internal loss of the device by more than two times, which explains the reduction of the device slope efficiency with doping. We have found that the benefit associated with the suppression of heterobarrier electron leakage outweighs lower efficiency near threshold leading to improved linearity of the light-current characteristics and higher output optical power and brightness. Broadened waveguide lasers with doped p-cladding/SCH interface have twice as high output optical power density and brightness compared to undoped BW devices.
DTIC
Additives; Semiconductor Lasers; Waveguides

20020027279 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
High-Power Free Electron Laser Using a Short Rayleigh Length
Colson, W. B.; Todd, A.; Neil, G. R.; Aug. 01, 2001; 2p; In English
Report No.(s): DE2001-789549; JLAB-ACT-01-21; DOE/ER/40150-1969; No Copyright; Avail: Department of Energy Information Bridge

Free Electron Lasers (FELs) have always had the potential for high average power, since the laser medium cannot be damaged, is transparent to all wavelengths, and the exhaust heat is removed at the speed of light. At MW power levels, the resonator mirrors of the oscillator are vulnerable to damage because of the small beam size in the undulator. We present a description of an FEL that uses a resonator with a short Rayleigh length in order to increase the mode area at the mirrors and reduce the intensity. The corresponding undulator must also be short. The whole FEL system is designed to be compact and efficient, producing about 1 MW of power at 1 mu-m infrared wavelengths using an electron beam of about 100 MeV with about 1 ampere of recirculating average current.
NTIS
Free Electron Lasers; Electron Beams; High Power Lasers; Infrared Spectra

20020030270 Air Command and Staff Coll., Maxwell AFB, AL USA
The Airborne Laser and the Future of Theater Missile Defense
Wirsig, Gerald W.; Mar. 1997; 42p; In English; Original contains color images
Report No.(s): AD-A397885; AU/ACSC/0581/97-03; No Copyright; Avail: Defense Technical Information Center (DTIC)

The theater ballistic missile (TBM) problem encountered in the Persian Gulf War revealed an alarming deficiency in US defenses. This paper takes a brief look at the major theater missile defense (TMD) systems in use and under development by the US today. Second, it focuses on the performance of the Army's Patriot defense system in the Gulf War. Finally, the paper fulfills

its main purpose of offering an in-depth look at the development of the Airborne Laser (ABL) and how it should fit into an overall national structure for TMD. The paper concludes that Patriot performance in the Gulf war was unsatisfactory, not just because of system flaws, but because of the concept of point defense itself. The ABL provides a unique solution to collateral damage inherent in point defense concepts. In addition, the ABL can provide advanced warning to other theater defense systems in the event of a mass launch which could overtax the ABL's capabilities. The paper offers several recommendations for the future direction of TMD. First, phase out point defense completely and channel those funds into development of the other TMD systems which minimize collateral damage to the assets they are intended to protect. Second, expedite development of the ABL as the first line of TMD, backed up by long range theater systems. Third, continue to develop true theater defense systems; that is, systems which have a range of hundreds of kilometers such as the Navy's Aegis and the Army's THAAD systems, preventing TBMs from getting close to their intended target.
DTIC
Airborne Lasers; Ballistic Missiles; Missile Defense; Military Technology

20020031747 Air Command and Staff Coll., Maxwell AFB, AL USA
Laser Options for National Missile Defense
Leonard, Steven G.; Apr. 1998; 108p; In English; Original contains color images
Report No.(s): AD-A398599; AU/ACSC/165/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
The Cold War threat that was characterized by a USSR launch of a large number of ballistic missiles towards the USA has been replaced today by an even less stable ballistic missile security environment. The US National Security Strategy recognizes the existence of threats with both the capability and will to use weapons of mass destruction launched by ballistic missiles. This threat environment coupled with a high leverage to attack ballistic missiles in the boost phase, points to a National Missile Defense (NMD) solution that includes laser weapons. Four boost-phase laser architectures have been evaluated using NMD technical, operational, fiscal and political criteria. The Space Based Laser (SBL), SBL with Relay Mirrors, Ground Based Laser (GBL) with Relay Mirrors, and Airborne Laser (ABL) with Relay Mirrors each meet the NMD requirements with varying degrees of success. Overall, a Relay Mirror architecture accepting multiple laser sources was found to produce the best NMD boost-phase defense while reducing potential technical, operational, and political issues. This analysis shows that US Space Command should implement a Relay Mirror architecture with the ability to accept multiple laser sources, such as the planned ABL or a future GBL. This would enable a powerful boost-phase NMD capability with future expandability at minimal cost. Improvements to this architecture could be implemented using SBL, GBL, or ABL sources as NMD or adjunct mission requirements increase.
DTIC
Missiles; Defense Program; Aerospace Systems; Mirrors; Armed Forces (USA)

20020032061 Birmingham Univ., Interdisciplinary Research Centre, UK
Research and Development in Net Shape Manufacturing Held in Birmingham, UK ***Final Report, 24-28 Mar. 1999***
Aug. 2000; 195p; In English; For individual articles, see ADP011564 thru ADP011587
Contract(s)/Grant(s): N000-99-004
Report No.(s): AD-A398718; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
Included are papers selected from among the 39 presented at the Conference on Research and Development in Net Shape Manufacturing. The papers covered all major areas of net shape processing and manufacturing: powder injection molding, net shape forging, sheet and roll forming, extrusion, HIPping, casting, rapid prototyping (tooling), laser processing, and spray forming.
DTIC
Conferences; Manufacturing; Shapes

20020032621 Glasgow Univ., UK
Native Oxide Laser Bars of Intersubband, Mid-Infrared Semiconductor Lasers ***Final Report***
Green, Jeremy; Ironside, Charlie N.; Stanley, Colin R.; May 25, 2001; 18p; In English
Contract(s)/Grant(s): F61775-00-WE062
Report No.(s): AD-A398903; EOARD-SPC-00-4062; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report results from a contract tasking University of Glasgow as follows: The contractor will investigate quantum cascade lasers fabricated using a new native oxide technique called planar selective wet oxide fabrication. This technique will be employed to fabricate arrays of such lasers on a single chip to obtain high powered laser bars operating at wavelengths around five microns.
DTIC
Fabrication; Semiconductor Lasers; Laser Arrays

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.

20020027272 Colorado School of Mines, Center for Welding Joining and Coatings Research, Golden, CO USA
New Welding Consumables and Practice for Highly Portable Field Repair ***Final Report***
Olson, D. L.; Dec. 20, 2001; 31p; In English
Contract(s)/Grant(s): DAAG55-98-1-0105
Report No.(s): AD-A398635; CSM-MT-CWJCR-001-024; ARO-33836.15-15-MS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

New welding consumables and practice for weld repair and extended service life were investigated. Exothermally assisted arc welding was successfully accomplished with both SMA and self-shielded FCA welding consumables on steels and the optimum range of exothermic additions and welding parameters was determined Metal powder-filled core aluminum wires were produced which, on welding, promote grain refinement in aluminum weld deposits. Grain refinement in aluminum welds is directly related to weldability by a reduction in the susceptibility for solidification cracking and an improvement in weld metal properties. The use of strip-to-wire mill to make metal powder-filled cored wires has demonstrated an effective methodology for making specialty welding consumable wires for the U.S. Army where their use is of low volume but essential to the manufacture or maintenance of special technical assemblies. Special attention has been given to the welding of light metals (Aluminum and magnesium alloys). Aluminum welding metallurgy and practices were reviewed and described in a chapter for the Handbook of Aluminum Metallurgy, Process and Equipment. The weldability of magnesium alloys was investigated because new magnesium alloys are being developed to reduce weight in vehicles. to evaluate the service life of time-dependent alloys (i.e., Superalloys relative to TCP intermetallic phase and aluminum precipitation strengthened alloys) and to determine the acceptability of a weld repair relative to its service life (fatigue), new nondestructive techniques are being developed based on electronic and magnetic property measurements.
DTIC
Welding; Portable Equipment; Life (Durability); Maintenance

20020028404 Army Research Lab., Cleveland, OH USA
Consideration of Moving Tooth Load in Gear Crack Propagation Predictions
Lewicki, David G., Army Research Lab., USA; Handschuh, Robert F., Army Research Lab., USA; Spievak, Lisa E., Cornell Univ., USA; Wawrzynek, Paul A., Cornell Univ., USA; Ingraffea, Anthony R., Cornell Univ., USA; Journal of Mechanical Design; March 2001; Volume 123, pp. 118-124; In English
Contract(s)/Grant(s): RTOP 712-30-13; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Robust gear designs consider not only crack initiation, but crack propagation trajectories for a fail-safe design. In actual gear operation, the magnitude as well as the position of the force changes as the gear rotates through the mesh. A study to determine the effect of moving gear tooth load on crack propagation predictions was performed. Two-dimensional analysis of an involute spur gear and three-dimensional analysis of a spiral-bevel pinion gear using the finite element method and boundary element method were studied and compared to experiments. A modified theory for predicting gear crack propagation paths based on the criteria of Erdogan and Sih was investigated. Crack simulation based on calculated stress intensity factors and mixed mode crack angle prediction techniques using a simple static analysis in which the tooth load was located at the highest point of single tooth contact was validated. For three-dimensional analysis, however, the analysis was valid only as long as the crack did not approach the contact region on the tooth.
Author
Crack Propagation; Cracks; Gear Teeth; Boundary Element Method; Finite Element Method; Stress Analysis

20020030227 Argonne National Lab., IL USA
Performance of amorphous carbon coating in turbocompressor air bearings
Ajayi, O. O.; Woodford, J. B.; Erdemir, A.; Fenske, G. R.; Dec. 06, 2001; 14p; In English
Report No.(s): DE2001-789710; ANL/ET/CP-105671; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The U.S. Department of Energy has a program to develop fuel cell technology for automotive applications. For maximum efficiency, a fuel cell system requires a compact, lightweight, and highly efficient air compressor to provide a stream of clean air

to the fuel cell stack. Meruit, Inc., is developing a turbocompressor for this application. Journal and thrust air bearings are two critical components of the turbocompressor that require low friction and excellent wear resistance. These components were coated with Argonne's new low-friction amorphous carbon coating and tested in an air bearing test rig. Results to date show that the coating provides the required friction reduction, as indicated by reduction in time to lift-off of the radial journal bearing during cyclic start/stop testing. The coating also prevented wall climbing which can cause bearing instability. In spite of a slight imbalance in the coated test bearing, wear on the coated surface, which occurred by polishing and mild abrasion, was at an acceptable level.
NTIS
Gas Bearings; Carbon; Protective Coatings; Friction Reduction; Wear Resistance; Journal Bearings

20020031762 ARCADIS Geraghty and Miller, Inc., Research Triangle Park, NC USA
Heavy Duty Diesel Fine Particulate Matter Emissions: Development and Application of On-Road Measurement Capabilities ***Final Report, 1 Oct. 2000 - 1 Sep. 2001***
Brown, J. E.; Oct. 2001; 154p; In English
Report No.(s): PB2002-100140; No Copyright; Avail: National Technical Information Service (NTIS)

The report discusses EPA's On-road Diesel Emissions Characterization Facility, which has been collecting real-world gaseous emissions data for the past 6 years. It has recently undergone extensive modifications to enhance its particulate matter (PM) measurement capabilities, with specific emphasis on fine PM or PM-2.5 (particles smaller than 2.5 micrometers in aerodynamic diameter). At present the facility's capabilities are focused on continuous sampling and analysis, using fast-responding Oscillating Micro-balance (TEOM), and a particle-bound Polycyclic Aromatic Hydrocarbon (PAH) analyzer, all of which require a dilute exhaust sample. This dilute sample has been drawn directly from the vehicle exhaust via a stack dilution system, and sampled from the ambient exhaust plume via probes in the trailer. Dilute samples have also been collected on filters for chemical and gravimetric analysis.
NTIS
Diesel Engines; Exhaust Emission; Air Pollution; Exhaust Gases; Polycyclic Aromatic Hydrocarbons; Sampling

20020033024 NASA Ames Research Center, Moffett Field, CA USA
Theoretical Analysis of a Pulse Tube Regenerator
Roach, Pat R., NASA Ames Research Center, USA; Kashani, Ali, Atlas Scientific, USA; Lee, J. M., NASA Ames Research Center, USA; [1995]; 1p; In English; 1995 Cryogenic Engineering Conference, 17-21 Jul. 1995, Columbus, OH, USA
Contract(s)/Grant(s): RTOP 233-02-05-16; No Copyright; Avail: Issuing Activity; Abstract Only

A theoretical analysis of the behavior of a typical pulse tube regenerator has been carried out. Assuming simple sinusoidal oscillations, the static and oscillatory pressures, velocities and temperatures have been determined for a model that includes a compressible gas and imperfect thermal contact between the gas and the regenerator matrix. For realistic material parameters, the analysis reveals that the pressure and, velocity oscillations are largely independent of details of the thermal contact between the gas and the solid matrix. Only the temperature oscillations depend on this contact. Suggestions for optimizing the design of a regenerator are given.
Author
Regenerators; Design Analysis; Oscillations; Sine Waves

38
QUALITY ASSURANCE AND RELIABILITY

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

20020027711 National Inst. of Standards and Technology, Baldrige National Quality Program, Gaithersburg, MD USA
Baldridge National Quality Program, 2002: Criteria for Performance Excellence
2002; 70p; In English; Original contains color illustrations
Report No.(s): PB2002-101986; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

For 14 years, the Baldridge Criteria have been used by thousands of US organizations to stay abreast of ever-increasing competition and to improve performance. In todays business environment, the Criteria help organizations respond to the rapid pace of innovation, to a focus on core competencies, and to the challenges of outsourcing and supply chain management. Whether your business is small or large, is involved in service or manufacturing, or has one office or multiple sites across the globe, the Criteria provide a valuable framework that can help you plan in an uncertain environment. Use the Criteria to assess performance

on a wide range of key business indicators: customer, product and service, financial, human resource, and operational. The Criteria can help you align resources; improve communication, productivity, and effectiveness; and achieve strategic goals.
NTIS
Organizations; Standards

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.

20020027541 NASA Glenn Research Center, Cleveland, OH USA
Finite-Strain Fractional-Order Viscoelastic (FOV) Material Models and Numerical Methods for Solving Them
Freed, Alan D., NASA Glenn Research Center, USA; Diethelm, Kai, Technische Univ., Germany; [2002]; 2p; In English; EUROMECH Colloquium on Constitutive Equations for Polymer Microcomposites, 15-19 Jul. 2002, Vienna, Vienna, Austria, Austria; Sponsored by European Mechanics Committee, Unknown
Contract(s)/Grant(s): RTOP 708-24-13; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Fraction-order viscoelastic (FOV) material models have been proposed and studied in 1D since the 1930's, and were extended into three dimensions in the 1970's under the assumption of infinitesimal straining. It was not until 1997 that Drozdov introduced the first finite-strain FOV constitutive equations. In our presentation, we shall continue in this tradition by extending the standard, FOV, fluid and solid, material models introduced in 1971 by Caputo and Mainardi into 3D constitutive formula applicable for finite-strain analyses. to achieve this, we generalize both the convected and co-rotational derivatives of tensor fields to fractional order. This is accomplished by defining them first as body tensor fields and then mapping them into space as objective Cartesian tensor fields. Constitutive equations are constructed using both variants for fractional rate, and their responses are contrasted in simple shear. After five years of research and development, we now possess a basic suite of numerical tools necessary to study finite-strain FOV constitutive equations and their iterative refinement into a mature collection of material models. Numerical methods still need to be developed for efficiently solving fraction al-order integrals, derivatives, and differential equations in a finite element setting where such constitutive formulae would need to be solved at each Gauss point in each element of a finite model, which can number into the millions in today's analysis.
Derived from text
Viscoelasticity; Stability; Numerical Analysis; Finite Element Method; Cartesian Coordinates

20020029844 Los Alamos National Lab., NM USA
Damage detection using statistical process control
Sohn, H.; Fugate, M. L.; Farrar, C. R.; Nov. 01, 1999; 15p; In English
Report No.(s): DE2001-787247; LA-UR-99-6059; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Structural health monitoring is described in the context of a statistical process control paradigm. This process control techniques such as the Shewhart, the exponentially weighted moving average, and the cumulative sum control charts to vibration-based damage diagnosis. The control limits are first constructed based on the measurements obtained from the initial intact structure. Then, new data are monitored against the control limits. A statistically significant number of outliners outside the control limits indicate a system transition from a healthy state to a damage state. Environmental and operation conditions, such as temperature change and the magnitude variation of the input forces, are also incorporated into the monitoring process. Blind tests of various damage cases are conducted without prior knowledge of the actual damage scenarios to evaluate the performance of the presented control chart techniques.
NTIS
Damage Assessment; Structural Analysis; Control Systems Design; Damage

20020030738 NASA Marshall Space Flight Center, Huntsville, AL USA
Analysis of Graphite-Reinforced Cementitious Composites
Vaughan, R. E., NASA Marshall Space Flight Center, USA; February 2002; 208p; In English; Original contains color illustrations
Report No.(s): NASA/TM-2002-211545; NAS 1.15:211545; M-1040; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Strategically embedding graphite meshes in a compliant cementitious matrix produces a composite material with relatively high tension and compressive properties as compared to steel-reinforced structures fabricated from a standard concrete mix. Although these composite systems are somewhat similar, the methods used to analyze steel-reinforced composites often fail to characterize the behavior of their more advanced graphite-reinforced counterparts. This Technical Memorandum describes some of the analytical methods being developed to determine the deflections and stresses in graphite-reinforced cementitious composites. It is initially demonstrated that the standard transform section method fails to provide accurate results when the elastic moduli ratio exceeds 20. An alternate approach is formulated by using the rule of mixtures to determine a set of effective material properties for the composite. Tensile tests are conducted on composite samples to verify this approach. When the effective material properties are used to characterize the deflections of composite beams subjected to pure bending, an excellent agreement is obtained. Laminated composite plate theory is investigated as a means for analyzing even more complex composites, consisting of multiple graphite layers oriented in different directions. In this case, composite beams are analyzed using the laminated composite plate theory with material properties established from tensile tests. Then, finite element modeling is used to verify the results. Considering the complexity of the samples, a very good agreement is obtained.
Author
Cements; Composite Materials; Graphite; Mathematical Models; Tensile Tests; Reinforcing Materials; Reinforcement (Structures)

20020031246 Virginia Univ., School of Engineering and Applied Science, Charlottesville, VA USA
End Effects and Load Diffusion in Composite Structures ***Final Report, 1 May - 31 Dec. 2001***
Horgan, Cornelius O., Virginia Univ., USA; [2002]; 11p; In English
Contract(s)/Grant(s): NAG1-01022; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The research carried out here builds on our previous NASA supported research on the general topic of edge effects and load diffusion in composite structures. Further fundamental solid mechanics studies were carried out to provide a basis for assessing the complicated modeling necessary for large scale structures used by NASA. An understanding of the fundamental mechanisms of load diffusion in composite subcomponents is essential in developing primary composite structures. Specific problems recently considered were focussed on end effects in sandwich structures and for functionally graded materials. Both linear and nonlinear (geometric and material) problems have been addressed. Our goal is the development of readily applicable design formulas for the decay lengths in terms of non-dimensional material and geometric parameters. Analytical models of load diffusion behavior are extremely valuable in building an intuitive base for developing refined modeling strategies and assessing results from finite element analyses. The decay behavior of stresses and other field quantities provides a significant aid towards this process. The analysis is also amenable to parameter study with a large parameter space and should be useful in structural tailoring studies.
Derived from text
Composite Structures; Diffusion; Loads (Forces); Sandwich Structures; Solid Mechanics

20020032619 Sydney Univ., Dept. of Mechanical and Mechatronic Engineering, Australia
Optimization of Bonded Patch to Cylindrically Curved Shell Structures ***Final Report, 1 Nov. 2000-31 Oct. 2001***
Tong, Liyong; Sun, Xiannian; Dec. 2001; 81p; In English
Contract(s)/Grant(s): F62562-00-M-9220
Report No.(s): AD-A398887; FEARC-01-010; No Copyright; Avail: Defense Technical Information Center (DTIC)
Adhesive bonding has been used to join or repair metallic and composite structural components to achieve or restore their designated structural stiffness and strengths. However, current analysis methods and empirical databases for composite bonded patch repair or joints are limited to flat structures, and there exists a very limited knowledge on the effect of curvature on the performance and durability of composite bonded joints and repairs. Recently, a novel finite element formulation was presented for developing adhesive elements for conducting 2.5-dimensional simplified stress analysis of bonded repairs to curved structures. This report presents the work on optimal design of bonded composite patch using the newly developed adhesive element. Three types of design variables considered separately are (a) geometrical boundary shape of bonded composite patch, (b) ply drop-offs contour of bonded composite patch, and (c) fiber orientation of each ply in bonded composite patch. Sequential Linear Programming (SLP) method and one-dimensional direct search method are employed as the optimization algorithm in conjunction with a fully implemented mesh generation algorithm into which new features were incorporated. Several different objective functions were proposed to optimize the bonded patch.
DTIC
Composite Structures; Bonded Joints; Adhesive Bonding; Shells (Structural Forms)

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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.

20020027472 Geological Survey, Reston, VA USA
R s1magnetic surveys across Crater Flat and parts of Yucca Mountain, Nevada
Sikora, R. F.; Campbell, D. L.; Kucks, R. P.; Dec. 31, 1995; 19p; In English
Report No.(s): DE2001-769560; USGS-OFR-95-812-A; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

As part of a study to characterize a potential nuclear waste repository at Yucca Mountain, aeromagnetic surveys were conducted in April 1993 along the trace of a planned seismic profile across Crater Flat and parts of Yucca Mountain. This report includes a presentation and preliminary interpretation of the data. The profiles are at scales of 1:100,000. Also included are a gridded color contour map of the newly acquired data and a discussion of the likely applicability of very-low-frequency (VLF) electromagnetic surveys to Yucca Mountain investigations.
NTIS
Mountains; Nevada; Magnetic Surveys; Seismology

20020027672 Geological Survey, Las Vegas, NV USA
Interpretive geologic cross sections for the Death Valley regional flow system and surrounding areas, Nevada and California
Sweetkind, D. S.; Dickerson, R. P.; Blakely, R. J.; Denning, P. D.; Nov. 09, 2001; 1p; In English
Report No.(s): DE2001-789492; USGS-MF-2370; No Copyright; Avail: Department of Energy Information Bridge

This report presents a network of 28 geologic cross sections that portray subsurface geologic relations within the Death Valley regional ground-water system, a ground-water basin that encompasses a 3 degree x 3 degree area (approximately 70,000 square kilometers) in southern Nevada and eastern California. The cross sections transect that part of the southern Great Basin that includes Death Valley, the Nevada Test Site, and the potential high-level nuclear waste underground repository at Yucca Mountain. The specific geometric relationships portrayed on the cross sections are discussed in the context of four general sub-regions that have stratigraphic similarities and general consistency of structural style: (1) the Nevada Test Site vicinity; (2) the Spring Mountains, Pahrump Valley and Amargosa Desert region; (3) the Death Valley region; and (4) the area east of the Nevada Test Site.The subsurface geologic interpretations portrayed on the cross sections are based on an integration of existing geologic maps, measured stratigraphic sections, published cross sections, well data, and geophysical data and interpretations. The estimated top of pre-Cenozoic rocks in the cross sections is based on inversion of gravity data, but the deeper parts of the sections are based on geologic conceptual models and are more speculative.
NTIS
Geology; Ground Water; Death Valley (CA); Radioactive Wastes

20020027995 New York State Dept. of Environmental Conservation, Albany, NY USA
New York State Freshwater Wetlands Delineation Manual
Brown, S.; Crocoll, S.; Goetke, D.; Heaslip, N.; Kerpez, T.; Jul. 1995; 62p; In English
Report No.(s): PB2002-102467; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Manual is divided into three major parts: Preface, Part I - Technical Criteria for New York State Wetland Delineation, and Part II - Methods for Identification and Delineation of Wetland Boundaries. References, a glossary of technical terms, and appendices are included at the end of the manual. This Manual describes the methodologies employed by the DEC and the APA to delineate the boundaries of regulated freshwater wetlands in New York State. The Manual describes technical criteria, field indicators and other sources of information useful for wetland boundary delineation for areas subject to Article 24 regulation. The information is also applicable to wetlands regulated under the other New York laws such as Article 15 (ie. wetlands contiguous to navigable waters pursuant to 15-0505). Emphasis for delineation is on the upper boundary of wetlands (i.e. wetland-upland boundary) and not on the lower boundary between wetlands and deepwater habitats. This Manual makes use of methods and information found in 'Technical Report Y-87-1, Corps of Engineers Wetlands Delineation Manual' (1987). The Manual describes practical and efficient methods of delineating freshwater wetlands boundaries.
NTIS
Fresh Water; Wetlands; Plants (Botany); Information Systems

20020028011 Geological Survey, Reston, VA USA

Evidence for Hot Mississippi Valley-Type Brines in the Reelfoot Rift Complex, South-Central USA, in Late Pennsylvanian-Early Permian

Leach, D. L.; Repetski, J. E.; Powell, J. W.; Rowan, E. L.; Apodaca, L. E.; 1997; 46p; In English

Report No.(s): PB2002-102616; USGS-PP-1577; LCCCN-97-12553; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Petrographic and fluid inclusion studies of sparry dolomite cement from Upper Cambrian to Lower Ordovician rocks and conodont thermal-alteration indices provide evidence that hot Mississippi Valley-type brines were once present in the Reelfoot rift complex. The cathodoluminescent microstratigraphy of sparry dolomite cement in the Reelfoot rift resembles that of sparry dolomite cement associated with widespread Mississippi Valley-type mineral deposition in the Ozark region. If correlative cathodoluminescent zones in the sparry dolomite from the Ozark and Reelfoot rift regions indicate broadly contemporaneous dolomite deposition, then the results show that the Ozark Mississippi Valley-type hydrothermal system extended into the Reelfoot region and onto the western flank of the Nashville dome. Independent evidence supports the migration of Mississippi Valley-type brines into the Ozark region from the Reelfoot rift complex in late Paleozoic time. constraints on the thermal regime in the Reelfoot rift complex in late Paleozoic time.

NTIS

Brines; Petrography; Valleys; Geophysics

20020028364 Forest Service, Southern Research Station, Asheville, NC USA

Bottomland Hardwoods of the Mississippi Alluvial Valley: Characteristics and Management of Natural Function, Structure, and Composition. Proceedings of a Symposium. Held during the Natural Areas Conference in Fayetteville, Arkansas on October 28, 1

Hamel, P. B.; Foti, T. L.; Jul. 2001; 124p; In English

Report No.(s): PB2002-102646; FSGTR-SRS-42; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The lower Mississippi River floodplain supported about 9 million ha of hardwood forests, and now less than 2 million. Reforestation is a priority of resource agencies, but efforts are hampered by uncertainties about species composition and site relations of plant communities. We compared the first land survey notes for an area along the Mississippi River in the 1800's to modern forest. The results suggest that (1) geomorphic surfaces generally provide a good basis for discriminating general patterns of plant community structure and composition, (2) modern forests differ from the forests of the early settlement era in importance of dominant species, suggesting that modern forests may not be appropriate restoration models, and (3) future distribution of plant communities will be altered because the lower Mississippi River has been stabilized, affecting future environments of deposition. Importantly, oak species, the primary material for restoration efforts, have never been particularly dominant on these sites.

NTIS

Conferences; Mississippi River (US); Geomorphology; Flood Plains; Valleys; Reforestation

20020031715 Bureau of Reclamation, Denver, CO USA

Reservoir Sediment-Water Microcosm Simulation: Pre-Impoundment Predictions Versus Observed Water Quality at Ridgway Reservoir, Ridgway, Colorado

Craft, C.; Miller, J.; Sep. 2001; 124p; In English

Report No.(s): PB2002-102120; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Sediment-water microcosm simulation was used to predict post-impoundment hypolimnetic water quality of Ridgway Reservoir, Ridgway, Colorado, U.S.A. Reservoir basin soils and one river sediment were combined with Uncompahgre River water in 55-gal tanks, and water was sampled and analyzed before and after bacterially mediated reducing conditions developed. After completion of Ridgway Dam, the inflow streams, the reservoir, and outflow were sampled and analyzed on a monthly schedule from march 1987 to October 1996 for major ions, nutrients, and trace elements. Ridgway Reservoir contains 59,400 acre-ft. (2,094 m), and is approximately 200 ft (61 m) deep behind the dam. Despite extensive mine wastes and acidic drainage in the upper elevation reaches of the watershed, Ridgway Reservoir is an oligotrophic lake that has very low algal productivity and very good water quality. Reservoir median pH was 8.14 and dissolved solids ranged from 200 to 500 mg/L. Generally low total phosphorous concentrations (median=8.0 ug/L) and elevated total nitrogen:total phosphorus ratios (median ratios for unfiltered sample ranging from 26 to 52) suggest that the lake is phosphorus-limited. The post impoundment data also suggest that the reservoir improve downstream water quality by reducing inflow concentrations of trace elements and nutrients, with total nitrogen loading reduced by 38 percent and total phosphorus loading by 77 percent. Because of a lake bottom outlet in the dam and hyplimnion mixing from outlet operations, anoxic and reducing conditions at depth were not commonly observed during summer sampling. A comparison of simulation data with post impoundment chemistry revealed that microcosm simulation

reasonably predicted median reservoir behavior. Both simulation and post-impoundment chemistry data are presented, and modifications of simulation methodology and considerations regarding differences between soils and sediments are discussed.
NTIS
Reservoirs; Sediments; Water Quality; Phosphorus

20020031766 Geological Survey, Water Resources Div., Menlo Park, CA USA
Mountain Meadows Dacite: Olitocene Intrusive Complex that Welds Together the Los Anageles Basin, Northwestern Peninsular Ranges, and Central Transverse Ranges, California
McCulloh, T. H.; Beyer, L. A.; Morin, R. W.; 2000; 48p; In English
Report No.(s): PB2002-102111; USGS-PP-1649; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Dikes and irregular intrusive bodies of distinctive Oligocene biotite dacite and serially related hornblende latite and felsite occur widely in the central and eastern San Gabriel Mountains, southern California, and are related to the Telegraph Peak granodiorite pluton. Identical dacite is locally present beneath Middle Miocene Topanga Group Glendora Volcanics at the northeastern edge of the Los Angeles Basin, where it is termed Mountain Meadows Dacite. This study mapped the western and southwestern limits of the dacite distribution to understand the provenance of derived redeposited clasts, to percieve Neogene offsets on several large strike-slip faults, to test published palinspastic reconstructions, and to better understand the tectonic boundaries that separate contrasting pre-Tertiary rock terranes where the Peninsular Ranges meet the central and western Transverse Ranges and the Los Angeles Basin.
NTIS
Biotite; Rock Intrusions; Tectonics; Felsite

20020031787 Geological Survey, Water Resources Div., Lawrence, KS USA
Trends in Peak Flows of Selected Streams in Kansas
Rasmussen, T. J.; Perry, C. A.; 2001; 72p; In English
Report No.(s): PB2002-101957; USGS/WRI-01-4203; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The possibility of a systematic change in flood potential led to an investigation of trends in the magnitude of annual peak flows in Kansas. Efficient design of highway bridges and other flood-plain structures depends on accurate understanding of flood characteristics. The Kendall's tau test was used to identify trends at 40 stream-gaging stations during the 40-year period 1958-97. Records from 13 (32 percent) of the stations showed significant trends at the 95-percent confidence level. Only three of the records (8 percent) analyzed had increasing trends, whereas 10 record (25 percent) had decreasing trends, all of which were for stations located in the western one-half of the State. An analysis of flow volume using mean annual discharge at 29 stations in Kansas resulted in 6 station (21 percent) with significant trends in flow volumes. All six trends were decreasing and occurred in the western one-half of the State.
NTIS
Floods; Streams; Flood Plains

20020031979 Geological Survey, Water Resources Div., Lansing, MI USA
Steady-State Flow Distribution and Monthly Flow Duration in Selected Branches of St. Clair and Detroit Rivers within the Great Lakes Waterway
Holtschlag, D. J.; Koschik, J. A.; 2001; 70p; In English; Original contains color illustrations
Report No.(s): PB2002-103410; USGS/WRI-01-4135; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
St. Clair and Detroit Rivers are connecting channels between Lake Huron and Lake Erie in the Great Lakes waterway, and form part of the boundary between the USA and Canada. St. Clair River, the upper connecting channel, drains 222,400 square miles and has an average flow of about 182,000 cubic feet per second. Water from St. Clair River combines with local inflows and discharges into Lake St. Clair before flowing into Detroit River. In some reaches of St. Clair and Detroit Rivers, islands and dikes split the flow into two to four branches. Even when the flow in a reach is known, proportions of flows within individual branches of a reach are uncertain. Simple linear regression equations, subject to a flow continuity constraint, are developed to provide estimators of these proportions and flows. The equations are based on 533 paired measurements of flow in 13 reaches forming 31 branches. The equations provide a means for computing the expected values and uncertainties of steady-state flows on the basis of flow conditions specified at the upstream boundaries of the waterway.
NTIS
Flow Distribution; Waterways; Steady State; Upstream; Streams

20020031980 Geological Survey, Water Resources Div., Madison, WI USA

Water Resources of the Bad River Indian Reservation, Northern Wisconsin ***Final Report***

Batten, W. G.; Lidwin, R. A.; 1995; 54p; In English

Report No.(s): PB2002-103412; USGS-WRI-95-4207; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Water-resources data were collected in the Bad River Indian Reservation of northern Wisconsin from 1983 through 1987. Some data are interpreted to describe ground-water flow, groundwater quality, streamflow, and surface-water quality. Data also are presented in tables and appendixes for baseline reference. Precambrian sandstone and basalt underlie varying thicknesses of sandy till, outwash sand and gravel, and clay deposited in glacial meltwater lakes. The thickness of glacial deposits generally ranges from 100 to 300 ft but reaches a known thickness of almost 1,000 ft on the east-central edge of the Reservation. Sand and gravel deposits are generally buried beneath 50 to 150 ft of glacial lake clays and silts throughout most of the Reservation. These buried sand and gravel deposits lie directly on Precambrian sandstone of unknown thickness in the northern half of the Reservation. The sand and gravel deposits and the sandstone form a single aquifer system confined by the overlying clay deposits. In and near the village of Odanah, numerous wells finished in either the sand and gravel or in the sandstone flow above land surface. NTIS

Water Resources; Water Quality; Water Flow

20020031981 Geological Survey, Water Resources Div., Denver, CO USA

Interim Results of Quality-Control Sampling of Surface Water for the Upper Colorado River National Water-Quality Assessment Study Unit, Water Years 1995-96

Spahrand, N. E.; Boulger, R. W.; Jan. 01, 1997; 42p; In English

Report No.(s): PB2002-103414; USGS-WRI-97-4227; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Quality-control samples provide part of the information needed to estimate the bias and variability that result from sample collection, processing, and analysis. Quality-control samples of surface water collected for the Upper Colorado River National Water-Quality Assessment study unit for water years 1995-96 are presented and analyzed in this report. The types of quality-control samples collected include pre-processing split replicates, concurrent replicates, sequential replicates, post-processing split replicates, and field blanks. NTIS

Surface Water; Water Quality; Variability

20020031982 Geological Survey, Lakewood, CO USA

MODFLOW-2000: The US Geological Survey Modular Ground-Water Model-User Guide to Modularization Concepts and the Ground-Water Flow Process

Harbaugh, A. W.; Banta, E. R.; Hill, M. C.; McDonald, M. G.; 2000; 134p; In English; Original contains color illustrations

Report No.(s): PB2002-103362; USGS/OFR-00-92; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

MODFLOW is a computer program that numerically solves the three-dimensional ground-water flow equation for a porous medium by using a finite-difference method. Although MODFLOW was designed to be easily enhanced, the design was oriented toward additions to the ground-water flow equation. Frequently there is a need to solve additional equations; for example, transport equations and equations for estimating parameter values that produce the closest match between model-calculated heads and flows and measured values. This report documents a new version of MODFLOW, called MODFLOW-2000, which is designed to accommodate the solution of equations in addition to the ground-water flow equation. This report is a user's manual. It contains an overview of the old and added design concepts, documents one new package, and contains input instructions for using the model to solve the ground-water flow equation. NTIS

Ground Water; Water Flow; User Manuals (Computer Programs); Three Dimensional Flow; Geological Surveys

20020031984 Geological Survey, Water Resources Div., Boise, ID USA

Concentrations of Selected Trace Elements in Fish Tissue and Streambed Sediment in the Clark Fork-Pend Oreille and Spokane River Basins, Washington, Idaho, and Montana, 1998. National Water-Quality Assessment Program ***Final Report***

Maret, T. R.; Skinner, K. D.; 2000; 38p; In English

Report No.(s): PB2002-103356; USGS-WRI-00-4159; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Fish tissue and bed sediment samples were collected from 16 stream sites in the Northern Rockies Intermontane Basins study area in 1998 as part of the U.S. Geological Survey National Water- Quality Assessment Program. Bed sediment samples were analyzed for 45 trace elements, and fish livers and sportfish fillets were analyzed for 22 elements to characterize the occurrence

and distribution of these elements in relation to stream characteristics and land use activities. Nine trace elements of environmental concern--arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc--were detected in bed sediment, but not all of these elements were detected in fish tissue. Trace-element concentrations were highest in bed sediment samples collected at sites downstream from significant natural mineral deposits and (or) mining activities. Arsenic, cadmium, copper, lead, mercury, and zinc in bed sediment at some sites were elevated relative to national median concentrations, and some concentrations were at levels that can adversely affect aquatic biota.
NTIS
Trace Elements; Fishes; Sediments; Streams; River Basins; Mineral Deposits; Marine Biology

20020031985 Geological Survey, Water Resources Div., Mounds View, MN USA
Physical Characteristics of Stream Subbasins in the Pine River Basin, Central Minnesota
Fischer, B. C.; Sanocki, C. A.; 2000; 12p; In English
Report No.(s): PB2002-103326; USGS/OFR-00-171; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Data that describe the physical characteristics of stream subbasins upstream from selected sites on streams in the Pine River Basin, located in central Minnesota, are presented in this report. The physical characteristics are the drainage area of the subbasin, the percentage area of the subbasin covered only by lakes, the percentage area of the subbasin covered by both lakes and wetlands, the main-channel length, and the main-channel slope. Stream sites include outlets of subbasins of at least 5 square miles, and locations of U.S. Geological Survey high-flow, and continuous-record gaging stations.
NTIS
Water Quality; River Basins; Geological Surveys; Wetlands

20020032581 West Virginia Soil Conservation Agency, Guyan Soil Conservation District, Hamlin, WV USA
Watershed Assessment for Middle Fork, Mud River, Lincoln County (Hydrologic Unit No. 05070102080)
2000; 22p; In English
Report No.(s): PB2002-102797; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Introduction; Social & Economic characteristics; Soils; Land use; Urban; Mining; Forestland; Agriculture; Pastureland; Cropland; Farmsteads; Environmental resources; Fish and wildlife; Threatened/endangered species; Wetlands; Riparian areas; Water quality; Surface water; Ground water; Cultural resources; Flood assessment; Streambank erosion; Table 1 and References and data sources.
NTIS
Watersheds; Land Use; Ground Water; Cultural Resources; Farmlands

20020032582 Natural Resources Conservation Service, Moorefield, WV USA
Watershed Assessment for the Mudlick Run Watershed, Hardy County, West Virginia: Subdrainage for Hydrologic Unit No. 02070001070
Sep. 2000; 16p; In English
Report No.(s): PB2002-102799; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Introduction; Social characteristics; Land use; Environmental & Cultural Resources; Flood damage; Streambank Erosion and References.
NTIS
Watersheds; Cultural Resources; Flood Damage

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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.

20020027676 Johnson Controls World Services, Moffett Field, CA USA
Geostatistical Approaches for Spatial Estimation of Vegetation Quantities Using Ground and Image Data
Dungan, Jennifer L., Johnson Controls World Services, USA; [1995]; 1p; In English; Remote Sensing in Action Conference, 11-14 Sep. 1995, Southampton, UK
Contract(s)/Grant(s): RTOP 579-43-03-10; No Copyright; Avail: Issuing Activity; Abstract Only

A major challenge in the study of the earth system is the mapping of vegetation quantities over large regions. Geostatistical methods, such as cokriging and stochastic simulation, have the potential to exploit more fully both remotely sensed data and ground information and improve the spatial estimation of vegetation variables over traditional regression methods. A synthetic example constructed from imaging spectrometer data allows a useful comparison among regression, cokriging and a simple probability-field method. A range of linear relationships between direct (sampled) and ancillary images is used. The lowest root-mean-square-error is achieved with cokriging until the correlation between direct and ancillary data exceeds .89, at which point regression is the superior estimator. Probability-field simulation gives a range of possible realizations, most more precise than those from regression. The relationship between ground measurements and image data is thus demonstrated to be one of the critical factors in the choice of a spatial estimation method.
Author
Vegetation; Data Acquisition; Imaging Techniques; Spatial Dependencies; Remote Sensing; Statistical Analysis; Geology

20020028888 NASA Goddard Space Flight Center, Greenbelt, MD USA
Aerosol Profile Retrievals from Integrated Dual Wavelengths Space Lidar ESSP3-CENA and Spectral Radiance MODIS Data
Kaufman, Yoram, NASA Goddard Space Flight Center, USA; Mattoo, Shana, Science Systems and Applications, Inc., USA; Tanre, Didier, Universite des Sciences et Techniques de Lille Flandres Artois, France; Kleidman, Richard, Science Systems and Applications, Inc., USA; [2001]; 1p; In English; 2001 Fall AGU Meeting, 10-14 Dec. 2001, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The ESSP3-CENA space mission (formally PICASSO-CENA) will provide continues global observations with a two wavelength lidar. The attenuated backscattering coefficients measured by the lidar, have valuable information about the vertical distribution of aerosol particles and their sizes. However the information cannot be mapped into unique aerosol physical properties. Infinite number of physical solutions with different attenuations through the atmosphere can reconstruct the same two wavelength backscattered profile measured from space. Spectral radiance measured by MODIS simultaneously with the ESSP3 data can constrain the problem and resolve this ambiguity to a large extent. Sensitivity study shows that inversion of the integrated MODIS+ESSP3 data can derive the vertical profiles of the fine and coarse modes mixed in the same atmospheric column in the presence of moderate calibration uncertainties and electronic noise (approx. 10%). We shall present the sensitivity study and results from application of the technique to measurements in the SAFARI-2000 and SHADE experiments.
Author
Space Missions; Aerosols; Imaging Spectrometers; Optical Radar; Radiance; Emission Spectra

20020030360 Colorado Univ., Inst. of Arctic and Alpine Research, Boulder, CO USA
Geostatistical Methods For Determination of Roughness, Topography, and Changes of Antarctic Ice Streams From SAR and Radar Altimeter Data ***Final Report, 1995 - 1999***
Herzfeld, Ute C., Colorado Univ., USA; Feb. 21, 2002; 33p; In English
Contract(s)/Grant(s): NAGW-3790; NAG5-6114; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The central objective of this project has been the development of geostatistical methods fro mapping elevation and ice surface characteristics from satellite radar altimeter (RA) and Syntheitc Aperture Radar (SAR) data. The main results are an Atlas of elevation maps of Antarctica, from GEOSAT RA data and an Atlas from ERS-1 RA data, including a total of about 200 maps with 3 km grid resolution. Maps and digital terrain models are applied to monitor and study changes in Antarctic ice streams and glaciers, including Lambert Glacier/Amery Ice Shelf, Mertz and Ninnis Glaciers, Jutulstraumen Glacier, Fimbul Ice Shelf, Slessor Glacier, Williamson Glacier and others.
Derived from text
Antarctic Regions; Surface Roughness; Topography; Synthetic Aperture Radar; Geosat Satellites; Radio Altimeters; Sea Ice; Mathematical Models

20020031775 Geological Survey, Water Resources Div., Lawrence, KS USA
Baseline Water Quality and Preliminary Effects of Artificial Recharge on Ground Water, South-Central Kansas ***Final Report, 1995-1998***
Ziegler, A. C.; Christensen, V. G.; Ross, H. C.; 1999; 84p; In English
Report No.(s): PB2002-102508; USGS-WRI-99-4250; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

To investigate the feasibility of artificial recharge as a method of meeting future water-supply needs and to protect the Equus Beds aquifer from saltwater intrusion from natural and anthropogenic sources to the west, the Equus Beds Ground-Water Recharge Demonstration Project was begun in 1995. The project is a cooperative effort between the city of Wichita and the Bureau of

Reclamation, U.S. Department of the Interior. During the project, high flows from the Little Arkansas River are captured and recharged into the Equus Beds aquifer through recharge basins, a trench, or a recharge well, located at two recharge sites near Halstead and Sedgwick, Kansas. to document baseline concentrations and compatibility of stream (recharge) and aquifer water, the U.S. Geological Survey collected water samples from February 1995 through August 1998. These samples were analyzed for dissolved solids, total and dissolved inorganic constituents, nutrients, organic and volatile organic compounds, radionuclides, and bacteria.
NTIS
Water Quality; Ground Water; Bacteria; Geological Surveys; Organic Compounds; Aquifers

20020031778 TN and Associates, Inc., Cincinnati, OH USA
Gathering Information for Watershed Ecological Assessments: A Review of Ten Watershed Assessments
SchubauerBerigan, J. P.; Bruins, R. J. F.; Serveiss, V. B.; Little, J.; Eskew, D. L.; Sep. 2000; 182p; In English
Report No.(s): PB2002-102515; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The document outlines and reviews the various types of information used in 10 different watershed assessments. Data tables that describe the data types, sources of data, data reliability, and study contacts as well as other information used in each of the 10 assessments are included along with the web links to assess each of the 10 watershed assessments and outline some of the types and sources of data that are available. The purpose of the information is on the Internet. The document summarizes how the information was collected, used and evaluated. This report is to provide those conducting watershed ecological assessments with an introduction to the types and sources of information that are available and have been used by others in conducting such assessments. This document is intended for ecologists, hydrologists, biologists, geologists, engineers and water resource managers seeking assistance on gathering, organizing and analyzing data to improve the use of sound science in watershed scale decision making.
NTIS
Watersheds; Water Resources; Information Systems; Geological Surveys; Ecosystems

20020032067 North Central Forest Experiment Station, Saint Paul, MN USA
Forest Inventory Mapmaker Users Guide
Miles, P. D.; 2001; 62p; In English
Report No.(s): PB2002-102319; FSGTR-NC-221; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The goal of this manual is to provide you with an understanding of the basic concepts behind the Forest Inventory Mapmaker program. These concepts are discussed in the body of the manual. Because many people learn best by doing, tutorial are provided to reinforce these concepts. So, if you have access to the Internet, I encourage you to skip to the back of the manual and try the four tutorials before you read the rest of the manual. In brief, the Forest Inventory Mapmaker program provides users with the ability to easily generate table and maps without the need for understanding the underlying data structures.
NTIS
Inventories; Data Structures; Forests; Internets

20020032585 Forest Service, Pacific Northwest Research Station, Portland, OR USA
Ex situ Gene Conservation for Conifers in the Pacific Northwest
Lipow, S. R.; St. Clair, J. B.; Johnson, G. R.; Jan. 2002; 64p; In English
Report No.(s): PB2002-103013; FSGTR-PNW-528; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Recently, a group of public and private organizations responsible for managing much of the timberland in western Oregon and Washington formed the Pacific Northwest forest tree Gene Conservation Group (GCG) to ensure that the evolutionary potential of important regional tree species is maintained. The group is first compiling data to evaluate the genetic resource status of several species of conifers both at their original location (in situ) and at some other location (ex situ). We summarize the ex situ genetic resources present in seed orchards, provenance and progeny tests, seed stores, and clone banks both in western Oregon and Washington and in other countries with germplasm that originated in western Oregon and Washington. Some species, such as ponderosa pine (Pinus ponderosa Dougl. ex Laws.), noble fir (Abies procera Rehd.), and western hemlock (Tsuga heterophylla (Raf.) Sarg.) are found to have extensive genetic resources in ex situ forms. The resources for western redcedar (Thuja plicata Donn ex D. Don), for example, are more limited. Disease greatly influenced the development of ex situ genetic resources for western white pine (P. monticola Dougl. ex D. Don), sugar pine (P. lambertiana Dougl.), and Sitka spruce (Picea sitchensis (Bong.)). The summaries of genetic resources are, therefore, placed in the context of issues affecting each species. This provides

land managers with the accurate information necessary for assessing the potential value of each resource for gene conservation and for prioritizing future actions.
NTIS
Conifers; Forest Management; Genetics; Resources Management; Forests

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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.

20020027467 Oak Ridge National Lab., TN USA
Reference Scenario for an Advanced Deuterium Power Plant System
Sheffield, J.; Sep. 17, 2001; 4p; In English
Report No.(s): DE2001-788657; P01-111890; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The proposal is to make large deuterium (D-D) magnetic fusion power plants in which some (most) of the tritium produced by fusion is removed and stored. This tritium will ultimately decay to helium-3 that will be recycled to supplement the helium-3 produced by fusion. Thus the dominant fusion becomes that of deuterium and helium-3. The level of neutron damage is reduced very substantially from that for a D-T power plant.
NTIS
Nuclear Fusion; Deuterium; Thermonuclear Reactions

20020027473 Department of Energy, Casper, WY USA
Naval Petroleum Reserve No. 3 Site Environmental Report
Jun. 14, 2000; 23p; In English
Report No.(s): DE2001-769371; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The CY1999 Site Environmental Report and Compliance Summary discusses environmental compliance activities for NPR-3 (Teapot Dome). All hazardous wastes that were stored in the hazardous waste accumulation at NPR-3 were removed in CY1999. NPR-3 maintains its status as a conditionally exempt small quantity generator. Hydrogen sulfide (H2S) flares have not operated at NPR-3 since 1996; monitoring of H2S indicates readings well below limits. All underground storage tanks were removed in 1998. Wastewater samples were in compliance with applicable standards.
NTIS
Crude Oil; Hazardous Wastes; Environmental Monitoring

20020027474 National Energy Technology Lab., Pittsburgh, PA USA
Novel CO2 separation system *Monthly Report, Sep. 1998*
Copeland, R. J.; Mar. 01, 2000; 11p; In English
Report No.(s): DE2001-789049; AC26-98FT40421-02; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Because of concern over global climate change, new systems are needed that produce electricity from fossil fuels and emit less CO(sub 2). The fundamental problem with current systems which recover and concentrate CO(sub 2) from flue gases is the need to separate dilute CO(sub 2) and pressurize it to roughly 35 atm for storage or sequestration. This is an energy intensive process that can reduce plant efficiency by 9-37% and double the cost of electricity. There are two fundamental reasons for the current high costs of power consumption, CO(sub 2) removal, and concentration systems: (1) most disposal, storage and sequestering systems require high pressure CO(sub 2) (at roughly 35 atm). Thus, assuming 90% removal of the CO(sub 2) from a typical atmospheric pressure flue gas that contains 10% CO(sub 2), the CO(sub 2) is essentially being compressed from 0.01 atm to 35 atm (a pressure ratio of 3,500). This is a very energy intensive process. (2) The absorption-based (amine) separation processes that are used to remove the CO(sub 2) from the flue gas and compress it to 1 atm consume approximately 10 times as much energy as the theoretical work of compression because they are heat driven cycles working over a very low temperature difference. Thus, to avoid the problems of current systems, we need a power cycle in which the CO(sub 2) produced by the oxidation of the fuel is not diluted with a large excess of nitrogen, a power cycle which would allow us to eliminate the very inefficient thermally driven absorption/desorption step. In addition, we would want the CO(sub 2) to be naturally available at high

pressure (approximately 3 to 6 atmospheres), which would allow us to greatly reduce the compression ratio between generation and storage (from roughly 3,500 to approximately 8).
NTIS
Carbon Dioxide; Flue Gases; Climate Change; Separators

20020027476 National Renewable Energy Lab., Golden, CO USA
Baseline Evaluation of Thin-Film Amorphous Silicon, Copper Indium Diselenide, and Cadmium Telluride for the 21st Century: Preprint
Zweibel, K.; Apr. 01, 1999; 15p; In English
Report No.(s): DE2001-789291; NREL/CP-520-29593; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper examines three thin-film PV technologies: amorphous silicon, cadmium telluride, and copper indium selenide. The purpose is to: (1) assess their status and potential; (2) provide an improved set of criteria for comparing these existing thin films against any new PV technological alternatives, and examining the longer-term (c. 2050) potential of thin films to meet cost goals that would be competitive with conventional sources of energy without any added value from the substantial environmental advantages of PV. Among the conclusions are: (1) today's thin films have substantial economic potential, (2) any new approach to PV should be examined against the substantial achievements and potential of today's thin films, (3) the science and technology base of today's thin films needs substantial strengthening, (4) some need for alternative technologies exists, especially as the future PV marketplace expands beyond about 30 GW of annual production.
NTIS
Amorphous Silicon; Cadmium Tellurides; Copper Indium Selenides; Thin Films; Photovoltaic Cells; Economics

20020027477 National Renewable Energy Lab., Golden, CO USA
PV Optics: An Optical Modeling Tool for Solar Cell and Module Design; Preprint
Sopori, B.; Madjdpour, J.; Zhang, Y.; Chen, W.; Apr. 01, 1999; 9p; In English
Report No.(s): DE2001-789290; NREL/CP-520-29592; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A brief description of the capabilities of PV Optics, a software package for the design and analysis of solar cells and modules, is given. Some specific applications of the software for the design of thick and thin film cells are given.
NTIS
Solar Cells; Optics; Mathematical Models; Design Analysis; Modules; Applications Programs (Computers)

20020027478 National Renewable Energy Lab., Golden, CO USA
Photovoltaics Characterization: An Overview; Preprint
Kazmerski, L.; Lynn, K. G.; Apr. 01, 1999; 14p; In English
Report No.(s): DE2001-789289; NREL/CP-520-29591; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In order to move to a next generation of characterization methods, the requirements must be fully understood and documented. Presented herein are the required functionalities for the next generation of characterization methods. This paper is not meant to be exhaustive, but instead presents new developing characterization methods. The basic characterization requirements are outlined in the introduction. It is expected that in the future, phenomena will be understood on the atomic scale and applied to large-scale arrays for a complete understanding of the various affects that determine the real cell efficiency. There is a need for a fundamental understanding from atomic and nanoscale characterizations of impurities, native defects, extended defects and interfaces to provide the necessary understanding of these types of PV cells. This information from fundamental probes should be used for input to the performance characterization of the developing technologies, which include high-flux operation, multijunction and lower band-gap systems. These methods will allow new materials to come to realization at a much faster rate than was possible in previous years.
NTIS
Photovoltaic Conversion; Nanotechnology

20020027479 National Renewable Energy Lab., Golden, CO USA
Novel Materials for Photovoltaic Technologies: Preprint
Ginley, D.; Nozik, A.; Meyer, G.; Rosenthal, S.; Apr. 01, 1999; 8p; In English
Report No.(s): DE2001-789288; NREL/CP-520-29590; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

While existing photovoltaic technologies continue to advance, there are still many exciting opportunities in the area of novel materials. These opportunities arise because there is a substantial need for reducing the costs associated with the preparation and processing of photovoltaics, and because the theoretically possible photovoltaic efficiencies have yet to be achieved in practical devices. Thus it remains reasonable to continue photovoltaic research activity aimed at entirely new approaches to processing and at entirely new materials as the active media. This group identified three areas for further consideration: (a) Nano/molecular composites and hierarchical structures; (b) Organic semiconductors; and (c) Hot carrier devices.
NTIS
Photovoltaic Cells; Nanotechnology; Semiconductors (Materials)

20020027715 Southwest Technology Development Inst., Las Cruces, NM USA
Photovoltaic Power Systems and the 'National Electrical Code': Suggested Practices
Wiles, J.; Mar. 2001; 122p; In English
Report No.(s): PB2002-101365; No Copyright; Avail: National Technical Information Service (NTIS)

This suggested practices manual examines the requirements of the National Electrical Code (NEC) as they apply to photovoltaic (PV) power systems. The design requirements for the balance of systems components in a PV system are addressed, including conductor selection and sizing, overcurrent protection ratings and location, and disconnect ratings and location. PV array, battery, charge controller, and inverter sizing and selection are not covered, as these items are the responsibility of the system designer, and they in turn determine the items in this manual. Stand-alone, hybrid, and utility-interactive PV systems are all covered. References are made to applicable sections of the NEC.
NTIS
Manuals; Procedures; Specifications; Photovoltaic Cells

20020027997 National Inst. of Standards and Technology, Gaithersburg, MD USA
Proposed Testing Methodology and Laboratory Facilities for Evaluating Residential Fuel Cell Systems
Davis, M. W.; Jan. 2002; 18p; In English
Report No.(s): PB2002-102516; NISTIR-6848; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Fuel cells are emerging as one of the most promising technologies for meeting the nation's energy needs. Fuel cell efficiencies, approaching 60%, are nearly twice as efficient as conventional power plants. The National Institute of Standards and Technology (NIST) proposes a test method and rating methodology that will capture the overall performance of a residential fuel cell system in the same manner that NIST derived methods of tests exist for heat pump, gas furnaces, water heaters, and other household appliances. The test method will take into account any inefficiencies associated with the fuel cell stack and reformer; the conversion efficiency of the inverter; and any useful water or space heating contributions. The test method will identify and specify environmental and electrical load parameters that may affect performance, as well as the effect of transient loads on the system performance. Finally, rating methodologies will be under representative load and climatic conditions for a specified geographical location.
NTIS
Fuel Cells; Climatology; Energy Conversion Efficiency; Water Heating

20020028054 National Energy Technology Lab., Pittsburgh, PA USA
Novel CO2 separation system ***Quarterly Report, 16 Jan. - 15 Apr. 2000***
Copeland, R. J.; May 01, 2000; 23p; In English
Report No.(s): DE2001-789050; AC26-98FT40421-03; No Copyright; Avail: Department of Energy Information Bridge

Because of concern over global climate change, new systems are needed that produce electricity from fossil fuels and emit less CO(sub 2). The fundamental problem with current systems which recover and concentrate CO(sub 2) from flue gases is the need to separate dilute CO(sub 2) and pressurize it to roughly 35 atm for storage or sequestration. This is an energy intensive process that can reduce plant efficiency by 9-37% and double the cost of electricity. There are two fundamental reasons for the current high costs of power consumption, CO(sub 2) removal, and concentration systems: (1) most disposal, storage and sequestering systems require high pressure CO(sub 2) (at roughly 35 atm). Thus, assuming 90% removal of the CO(sub 2) from a typical atmospheric pressure flue gas that contains 10% CO(sub 2), the CO(sub 2) is essentially being compressed from 0.01

atm to 35 atm (a pressure ratio of 3,500). This is a very energy intensive process. (2) The absorption-based (amine) separation processes that are used to remove the CO(sub 2) from the flue gas and compress it to 1 atm consume approximately 10 times as much energy as the theoretical work of compression because they are heat driven cycles working over a very low temperature difference. Thus, to avoid the problems of current systems, we need a power cycle in which the CO(sub 2) produced by the oxidation of the fuel is not diluted with a large excess of nitrogen, a power cycle which would allow us to eliminate the very inefficient thermally driven absorption/desorption step. In addition, we would want the CO(sub 2) to be naturally available at high pressure (approximately 3 to 6 atmospheres), which would allow us to greatly reduce the compression ratio between generation and storage (from roughly 3,500 to approximately 8).
NTIS
Carbon Dioxide; Separators; Climate Change

20020028407 NASA Glenn Research Center, Cleveland, OH USA
Modeling Heat Flow In a Calorimeter Equipped With a Textured Solar Collector
Jaworske, Donald A., NASA Glenn Research Center, USA; Allen, Bradley J., Ohio State Univ., USA; [2001]; 6p; In English; 36th Intersociety Energy Conversion Engineering Conference, 29 Jul. - 2 Aug. 2001, Savannah, GA, USA; Sponsored by American Society of Mechanical Engineers, USA
Contract(s)/Grant(s): RTOP 755-A4-13
Report No.(s): IECEC2001-TM-15; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Heat engines are being considered for generating electric power for minisatellite applications, particularly for those missions in high radiation threat orbits. to achieve this objective, solar energy must be collected and transported to the hot side of the heat engine. A solar collector is needed having the combined properties of high solar absorptance, low infrared emittance, and high thermal conductivity. to test candidate solar collector concepts, a simple calorimeter was designed, manufactured, and installed in a bench top vacuum chamber to measure heat flow. In addition, a finite element analysis model of the collector/calorimeter combination was made to model this heat flow. The model was tuned based on observations from the as-manufactured collector/calorimeter combination. In addition, the model was exercised to examine other collector concepts, properties, and scale up issues.
Author
Calorimeters; Heat Engines; Heat Transmission; Solar Collectors; Solar Energy Absorbers

20020029715 Netherlands Energy Research Foundation, Petten, Netherlands
Advanced Reliability Improvement of AC-Modules (ARIA)
Rooij, P.; Real, M.; Moschella, U.; Sample, T.; Kardolus, M.; Sep. 2001; 60p; In English
Report No.(s): PB2002-103009; ECN-C-01-093; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The AC-module is a relatively new development in PV-system technology and offers significant advantages over conventional PV-systems with a central inverter :eg. Increased modularity, ease of installation and freedom of system design. Countries like The Netherlands and Switzerland have a leading position in the field of AC-modules, both in terms of technology and of commercial, large scale, application. An obstacle towards large scale market introduction of AC-modules is that the reliability and operational lifetime of AC-modules and the integrated inverters in particular is not yet proven. Despite the advantages, no module-integrated inverter has yet achieved large scale introduction. The AC-modules will lower the barrier towards market penetration. But due to the great interest in the new AC-module technology there is the risk of introducing a not fully proven product. This may damage the image of PV-systems. to speed up the development and to improve the reliability, research institutes and PV-industry will address the aspects of reliability and operational lifetime of AC-modules.
NTIS
Electric Batteries; Alternating Current; Industries; Systems Engineering

20020030228 Argonne National Lab., IL USA
Fuel processor for fuel cell systems
Pereira, C.; Ahmed, S.; Krumpelt, M.; Oct. 17, 2001; 8p; In English
Report No.(s): DE2001-789720; ANL/CMT/CP-106048; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Argonne National Laboratory is developing a liquid fuel processor for converting hydrocarbon to a hydrogen-rich feed suitable for a polymer electrolyte fuel cell stack. The processor uses an autothermal reformer to convert the feed to a mixture of hydrogen, carbon dioxide, carbon monoxide and water with trace quantities of other components. The carbon monoxide in the product gas is then converted to carbon dioxide in water-gas shift and preferential oxidation reactors. Fuels that have been tested

include standard and low-sulfur gasoline and diesel fuel, and Fischer-Tropsch fuels. Iso-octane and n-hexadecane were also examined as surrogates for gasoline and diesel, respectively. Complete conversion of gasoline was achieved at 750 C in a microreactor over a novel catalyst developed at Argonne. Diesel fuel was completely converted at 850 C over this same catalyst. Product streams contained greater than 60% hydrogen on a dry, nitrogen-free basis with iso-octane gasoline, and n-hexadecane. For a diesel fuel, product streams contained is greater than 50% hydrogen on a dry, nitrogen-free basis. The catalyst activity did not significantly decrease after is greater than 16 hours operation with the diesel fuel feed. Coke formation was not observed. The carbon monoxide fraction of the product gas could be reduced to as low as 1% on a dry, nitrogen-free basis when the water-gas shift reactors were used in tandem with the reformer.
NTIS
Fuel Cells; Hydrocarbons; Carbon Dioxide; Liquid Fuels; Electrolytic Cells

20020031145 NASA Glenn Research Center, Cleveland, OH USA
A Dust Characterization Experiment for Solar Cells Operating on Mars
Jenkins, Phillip, NASA Glenn Research Center, USA; Landis, Geoffrey A., NASA Glenn Research Center, USA; Krasowski, Michael, NASA Glenn Research Center, USA; Greer, Lawrence, NASA Glenn Research Center, USA; Wilt, David, NASA Glenn Research Center, USA; Baraona, Cosmo, NASA Glenn Research Center, USA; Scheiman, David, NASA Glenn Research Center, USA; Lekki, John, NASA Glenn Research Center, USA; [2001]; 4p; In English; IEEE Photovoltaic Specialists Conference, 17-22 Sep. 2000, Anchorage, AK, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA
Contract(s)/Grant(s): RTOP 755-A4-04; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
During the Viking and Pathfinder missions to Mars, significant amounts of dust accumulated on the spacecrafts. In Pathfinder's case, the dust obscured the solar panels on the lander and the rover degrading their output current. The material adherence experiment aboard the Pathfinder rover quantified the rate of decrease in short circuit current at 0.28% per day. This rate is unacceptably high for long duration missions. In response, NASA has developed the Dust Accumulation and Removal Technology (DART) experiment. DART has three instruments for characterizing dust settling out of the atmosphere and tests two methods to keep dust from settling on solar cells.
Author
Characterization; Dust; Settling; Solar Cells

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ENVIRONMENT POLLUTION

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

20020027458 Louisiana Univ. Marine Consortium, Chauvin, LA USA
Effects of Oil and Gas Development: A Current Awareness Bibliography
Bonvillain, S.; Rice, D.; Conover, J.; Dortch, Q.; Dec. 2000; 90p; In English
Contract(s)/Grant(s): MMS-14-35-0001-30660-19950
Report No.(s): PB2002-102149; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
'Effects of Oil and Gas Development: A Current Awareness Bibliography' is created in part of the research initiative between LUMCON, MMS, and the Coastal Marine Institute (CMI), with the aim of providing current awareness in all aspects of offshore oil and gas development. Eleven quarterly issues were prepared from January 1998 to July 2000 that contained approximately 850 citations, and were compiled into 'Effects of Oil and Gas Development: A Current Awareness Bibliography'. The bibliography evolved from 1990 to 1994 in response to increased demand and MMS's changing needs. Initially, there were no subject divisions and circulation was relatively limited. Eventually, the bibliography was sent quarterly to over 300 patrons who have direct ties to or interest in Minerals Management Service and coastal marine issues. In January 2000, a web base electronic database was created. The database includes all cumulative reports. Other types of searches that are applicable are: Author, Subject or keyword phrases. The database allows users to print their own copy of the published report. Starting in January 2001, the bibliography will be distributed electronically, with the anticipation of users going up accordingly.
NTIS
Bibliographies; Data Bases; Crude Oil; Industries; Oil Recovery

20020027459 Virginia Univ., Center for Transportation Studies, Charlottesville, VA USA

Ozone Formation Attributable to Emissions from Rural Interstate Traffic ***Final Report***

Jones, S. L.; Demetsky, M. J.; Fuentes, J. D.; May 2001; 164p; In English

Report No.(s): PB2002-102250; UVA/29472/CEO1/103; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The contribution of emissions from rural interstate traffic to local ground-level ozone formation is examined using microscopic traffic simulation and a photochemical simulation model. Atmospheric and micrometeorological data from a remote Canadian forest are simulated as a baseline case. Several traffic and traffic emissions scenarios are then compared to the baseline case. The results indicate that traffic emissions along a rural interstate contribute to substantial ozone formation in the rural environment when compared to ozone formation in the absence of vehicle emissions. Resultant ozone levels immediately above the roadway are estimated to be around 120 ppbv, roughly three times that produced in the baseline case. It is shown that the relatively large amounts of anthropogenic NO-x emitted from traffic, particularly heavy-duty vehicles, dominate the ozone formation in the immediate vicinity of the rural interstate. The results of the research support the most recent emission standards imposed on the trucking industry that require NO-x emissions for vehicles manufactured after 2004 to be reduced to half of their 1998 values. The results also support technologies and alternative fuels that further reduce NO-x emissions from heavy duty vehicles. The research suggests that rural interstates may be a significant local source of photochemical pollutants that requires explicit treatment in regional scale analyses.

NTIS

Exhaust Emission; Exhaust Gases; Ozone; Pollution Control; Air Pollution

20020027673 Brookhaven National Lab., Upton, NY USA

Ozone production in the Philadelphia urban area during NE-OPS 1999

Kleinman,; Daum,; Brechtel,; Lee,; Nunnermacker,; Oct. 01, 2001; 7p; In English

Report No.(s): DE2001-789488; BNL-68706; No Copyright; Avail: Department of Energy Information Bridge

As part of the 1999 NARSTO Northeast Oxidant and Particulate Study (NE-OPS) field campaign, the DOE G-1 aircraft sampled trace gases and aerosols in and around the Philadelphia metropolitan area. Twenty research flights were conducted between July 25 and August 11. The overall goals of these flights were to obtain a mechanistic understanding of O3 production; to characterize the spatial and temporal behavior of photo-oxidants and aerosols; and to study the evolution of aerosol size distributions, including the process of new particle formation. Within the NE-OPS program, other groups provided additional trace gas, aerosol, and meteorological observations using aircraft, balloon, remote sensing, and surface based instruments. In this article we provide an overview of the G-1 observations related to O3 production, focusing on the vertical distribution of pollutants. Ozone production rates are calculated using a box model that is constrained by observed trace gas concentrations. Highest O3 concentrations were observed on July 31, which we present as a case study. On that day, O3 concentrations above the 1-hour 120 ppb standard were observed downwind of Philadelphia and also in the plume of a single industrial facility located on the Delaware River south of the city.

NTIS

Ozone; Cities; Aerosols; Production; Atmospheric Composition; Trace Contaminants; Size Distribution

20020027992 New York State Dept. of Environmental Conservation, Albany, NY USA

Nitrate Deposition and Impact on Adirondack Streams

Simonin, H. A.; Kretser, W. A.; 2000; 16p; In English

Report No.(s): PB2002-102453; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Acidic deposition has a great impact on water chemistry and fish populations in the Adirondack region. Although the Clean Air Act Amendments of 1990 have resulted in some reductions of sulfate deposition, nitrate deposition has not yet been well controlled, and continues to impact aquatic resources. As part of the USEPA funded Episodic Response Project four Adirondack headwater streams were intensively monitored over an 18 month period. Atmospheric deposition was also monitored at a centrally located station. The quantity of nitrate being deposited on the study watersheds was calculated based on monthly net deposition data which ranged from 0.6 kg/ha/month to 3.6 kg/ha/month. These data were then compared to the monthly export of nitrate from the watershed in these streams. Nitrate concentrations were highest in the streamwater during the spring snowmelt period prior to the time when forest vegetation actively utilizes nitrate. On an annual basis the amount of nitrate which left the watershed via stream water exceeded the amount which fell as nitrate deposition. These data are important in documenting the impact of nitrate in the acidification of Adirondack streams during the spring, which coincides with brook trout hatching. Control programs for nitrous oxide emissions are presently aimed at reducing ozone levels during the May-September period. These emissions control

programs need to be expanded to also reduce nitrate deposition in the sensitive Adirondack region during the winter and spring periods when nitrate deposition has its greatest impact on aquatic resources.
NTIS
Air Quality; Environment Protection; Nitrous Oxides

20020028356 Denver Univ., Denver, CO USA
On-Road Remote Sensing of Automobile Emissions in the Denver Area: Year 3 ***Final Report***
Pokharel, S. S.; Bishop, G. A.; Stedman, D. H.; Oct. 2001; 48p; In English
Report No.(s): PB2002-102234; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The University of Denver (DU) has completed the 3rd year of a multi-year remote sensing study in the Denver area. The remote sensor used in this study is capable of measuring the ratios of carbon monoxide (CO), hydrocarbons (HC), and nitric oxide (NO) to carbon dioxide (CO2) in motor vehicle exhaust. From these ratios, DU calculates the percent concentrations of CO, CO2, HC, and NO in the exhaust that would be observed by a tailpipe probe, corrected for water and excess oxygen not involved in combustion. Mass emission per mass or volume of fuel can also be determined. The systems used in this study was configured to determine the speed and acceleration of the vehicle, and was accompanied by a video system to record license plates.
NTIS
Automobiles; Exhaust Emission; Remote Sensing; Air Pollution

20020028357 Texas A&M Univ., Texas Transportation Inst., College Station, TX USA
Effect of and Alternatives to Restricting Operation of Construction Equipment to Improve Regional Air Quality
Crawford, J. A.; 2001; 8p; In English
Report No.(s): PB2002-102304; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Texas National Resource Conservation Commission (TNRCC) rules, now withdrawn, were to affect Texas Department of Transportation (TXDOT) by placing restrictions on construction equipment activity. One rule, which was to become effective in 2005, sought to reduce ozone formation by limiting the amount of oxides of nitrogen (NO-x) produced by heavy-duty diesel equipment in the early morning hours. This project reviewed TNRCC's analysis, evaluated potential project cost and schedule impacts, assessed alternative emission control technologies, and evaluated the impacts of work zone lane closures for on-road emissions.
NTIS
Air Quality; Construction; Resources Management; Transportation

20020028359 North Carolina State Univ., Raleigh, NC USA
Computational and Experimental Study of Mercury Speciation as Facilitated by the Deacon Process
Ghorishi, S. B.; Edwards, J. R.; Srivastava, R. K.; Lee, C. W.; Kilgroe, J. D.; Aug. 2001; 18p; In English; A&WMA Speciality Conference on Mercury Emissions: Fate, Effects, and Control, Chicago, IL., August 21-23, 2001. Prepared in cooperation with ARCADIS Geraghty and Miller, Inc., Research Triangle Park,
Report No.(s): PB2002-102289; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The paper gives results of a computational and experimental study of mercury (Hg) speciation as facilitated by the Deacon process. Fly ashes that contain trace cupric or ferric oxide are effective catalysts for elemental mercury (Hg) conversion to mercuric chloride in the presence of hydrogen chloride, even at low reactor temperatures (less than 250 C). Since these same trace metals promote chlorine (C12) gas formation through the Deacon process, it is possible that this process, combined with gas-phase Hg chlorination pathways, can explain such speciation trends. In support of this hypothesis, experiments were conducted to determine if direct reactions of Hg with C12 gas are possible at low temperatures and if appreciable Hg is captured onto the model fly ash surface. These results are used to develop and refine a chemical kinetics model for Hg speciation as driven by chlorination induced by the Deacon process.
NTIS
Mercury Compounds; Mercury (Metal); Air Pollution; Hydrogen Chlorides

20020028892 NASA Goddard Space Flight Center, Greenbelt, MD USA
The New MODIS-Terra, and the Proposed COBRA Mission: First Global Aerosol Distribution and Properties Over Land and Ocean, and Plans to Measure Global Black Carbon Absorption Over the Ocean Glint
Kaufman, Yoram J., NASA Goddard Space Flight Center, USA; Tanre, Didier, Universite des Sciences et Techniques de Lille Flandres Artois, France; Remer, Lorraine, NASA Goddard Space Flight Center, USA; Martins, Vanderlei, Maryland Univ. Baltimore County, USA; Schoeberl, Mark, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; 2001 AGU Fall

Meeting, 10-14 Dec. 2001, San Francsico, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The MODIS instrument was launched on the NASA Terra satellite in Dec. 1999. Since last Oct, the sensor and the aerosol algorithm reached maturity and provide global daily retrievals of aerosol optical thickness and properties. MODIS has 36 spectral channels in the visible to IR with resolution down to 250 m. This allows accurate cloud screening and multi-spectral aerosol retrievals. We derive the aerosol optical thickness over the ocean and most of the land areas, distinguishing between fine (mainly man-made aerosol) and coarse (mainly natural) aerosol particles. New methods to derive the aerosol absorption of sunlight are also being developed. These measurements are use to track different aerosol sources, transport and the radiative forcing at the top and bottom of the atmosphere. However MODIS or any present satellite sensor cannot measure absorption by Black Carbon over the oceans, a critical component in studying climate change and human health. For this purpose we propose the COBRA mission that observes the ocean at glint and off glint simultaneously measuring the spectral polarized light and deriving precisely the aerosol absorption.

Author

Terra Spacecraft; Ocean Surface; Carbon; Absorption; Imaging Spectrometers; Aerosols; Air Water Interactions

20020029256 National Energy Technology Lab., Pittsburgh, PA USA

Investigation of mixed metal sorbent/catalysts for the simultaneous removal of sulfur and nitrogen oxides

Akyurtlu, A.; Akyurtle, J. F.; Aug. 01, 2001; 73p; In English

Report No.(s): DE2001-789669; FG22-96PC96216-10; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The original objective of this research was to conduct kinetic and parametric studies of the selective catalytic reduction of NO-x with NH3 and CH4 over alumina-supported cerium oxide and copper oxide-cerium oxide sorbent/catalysts; investigate SO2 removal at lower temperatures by supported copper oxide-cerium oxide sorbents; and investigate the possibility of elemental sulfur production during regeneration with CO or with CH4-air mixtures.

NTIS

Sorbents; Catalysts; Aluminum Oxides; Sulfur Dioxides

20020029261 Argonne National Lab., IL USA

Holistic look at minimizing adverse environmental impact under section 316(b) of the clean water act

Veil, J. A.; Puder, M. G.; Littleton, D. J.; Johnson, N.; Aug. 14, 2001; 20p; In English

Report No.(s): DE2001-789708; ANL/EA/CP-105549; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Section 316(b) of the Clean Water Act (CWA) requires that 'the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.' As the U.S. Environmental Protection Agency (EPA) develops new regulations to implement section 316(b), much of the debate has centered on adverse impingement and entrainment impacts of cooling water intake structures. Depending on the specific location and intake layout, once-through cooling systems withdrawing many millions gallons per day can, to a varying degree, harm fish and other aquatic organisms in the water bodies from which the cooling water is withdrawn.

NTIS

Intake Systems; Cooling Systems; Surface Water; Environmental Surveys; Marine Biology

20020029284 National Energy Technology Lab., Pittsburgh, PA USA

Advanced hybrid particulate collector: Pilot-scale testing

Zhuang, Y.; Miller, S. J.; Collings, M. E.; Olderbak, M. R.; Sep. 30, 2001; 25p; In English

Report No.(s): DE2001-789508; FC26-98FT40321-19; No Copyright; Avail: Department of Energy Information Bridge

The objective of the AHPC is to provide is greater than 99.99% particulate collection efficiency for particle sizes from 0.01 to 50 um and be applicable for use with all U.S. coals at a lower cost than existing technologies. In previous field tests with the AHPC, some minor bag damage was observed that appeared to be caused by electrical effects. Extensive studies were then carried out to determine the reason for the bag damage and to find possible solutions without compromising AHPC performance. The best solution to prevent the bag damage was found to be perforated plates installed between the electrodes and the bags, which can block the electric field from the bag surface and intercept current to the bags. The perforated plates not only solve the bag

damage problem, but also offer many other advantages such as operation at higher A/C (air-to-cloth) ratios, lower pressure drop, and an even more compact geometric arrangement.
NTIS
Particulates; Electric Fields; Electrostatic Precipitators

20020029296 National Energy Technology Lab., Pittsburgh, PA USA
Carbon dioxide capture from flue gas using dry regenerable sorbents
Green, D. A.; Turk, B. S.; Gupta, R. P.; Harrison, D. P.; Liang, Y.; Oct. 01, 2001; 30p; In English
Report No.(s): DE2001-789618; FC26-00NT40923-04; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this project is to develop a simple, inexpensive process to separate CO2 as an essentially pure stream from a fossil fuel combustion system using a regenerable, sodium-based sorbent. The sorbent being used in this project is sodium carbonate which is converted to sodium bicarbonate, 'baking soda,' through reaction with carbon dioxide and water vapor. Sodium bicarbonate is regenerated to sodium carbonate when heated, producing a nearly pure CO2 stream after condensation of water vapor. Testing conducted previously confirmed that the reaction rate and achievable CO2 capacity of sodium carbonate decreased with increasing temperature, and that the global rate of reaction of sodium carbonate to sodium bicarbonate increased with an increase in both CO2 and H2O concentrations. Energy balance calculations indicated that the rate of heat removal from the particle surface may determine the reaction rate for a particular particle system.
NTIS
Sorbents; Carbon Dioxide; Flue Gases; Carbon Dioxide Concentration; Fuel Combustion

20020029716 Netherlands Energy Research Foundation, Petten, Netherlands
Particulate Matter in Urban Air: Health Risks, Instrumentation and Measurements, and Political Awareness
Weijers, E. P.; Even, A.; Kos, G. P. A.; Groot, A. T. J.; Erisman, J. W.; Jul. 2001; 68p; In English
Report No.(s): PB2002-103008; ECN-R-01-002; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

One of the major sources of Particulate Matter (PM) in an urban environment is the vehicular traffic. The mobile sources emit large quantities of primary particles, composed mostly of soot and organic material, as well as gases that can act as precursors for new particle formation or can assist the growth of existing particles. The emitted PM has a larger proportion of ultra-fine particles and contain a number of other possible causative agents, such as policyclic aromatic hydrocarbons (PAH) and toxic metals. However, there are still few data on the emission factors for these PM characteristics. The influence of traffic on the presence of PM in air within large urban agglomerations and along busy motorways is the major issue of this study. This study consists of four parts: first, it describes the outcome of a literature study on the relationships between the adverse health effects and the physical and chemical characteristics of PM in air (chapter 2). The concern about the health effects is the determining factor for current and future scientific research (and associated financial funding). The second part (chapter 3) deals with further refinements of (existing) measuring techniques that were used in two experimental campaigns to be described in the third part (chapter 4 and 5).
NTIS
Particulates; Air Pollution; Polycyclic Aromatic Hydrocarbons; Organic Materials

20020030024 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Measurement of HO2 and Other Trace Gases in the Stratosphere Using a High Resolution Far-Infrared Spectrometer ***Annual Report, 1 Apr. - 31 Dec. 2001***
Traub, Wes, Smithsonian Astrophysical Observatory, USA; Chance, Kelly, Smithsonian Astrophysical Observatory, USA; January 2002; 3p; In English
Contract(s)/Grant(s): NAG5-9361; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report covers the time period 1 April 2001 to 31 December 2001. During this period we continued analyzing data from past flights, exploring issues such as radical partitioning, stratospheric transport, and molecular spectroscopy and further developed our beamsplitter technology.
Author
Beam Splitters; Molecular Spectroscopy; Stratosphere

20020030226 Argonne National Lab., IL USA

Measurements of beryllium-7 and ozone at Deer Park during the Texas 2000 air quality study

Gaffney, J. S.; Marley, N. A.; Oct. 10, 2001; 5p; In English

Report No.(s): DE2001-789711; ANL/ER/CP-105714; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

During the past few years, Houston, Texas, has surpassed Los Angeles in having the highest levels of ozone in an urban area. The Texas 2000 Air Quality study was conducted during the summer of 2000 to assess the reasons for this high ozone production. One possible source is ozone transported from aloft. Natural radionuclides have been proposed for use in monitoring the transport of ozone and aerosols in the troposphere (Gaffney et al. 1994, 1995). For example, 7Be is known to be produced in the upper troposphere and lower stratosphere by interactions with cosmogenic particles. Beryllium-7 has a 53.28-day half-life and is a gamma emitter that attaches itself to fine particles in the atmosphere once it is formed. Indeed, in tropospheric aerosol samples 7Be is typically found in association with aerosol particles that are 0.3 un in diameter. Some investigators have asserted that ozone from aloft can be transported into rural and urban regions during stratospheric-tropospheric folding events, leading to increased background levels of ozone.

NTIS

Air Quality; Ozone; Beryllium 7; Beryllium Isotopes; Gas Transport; Air Sampling; Aerosols

20020030229 Argonne National Lab., IL USA

Northeast oxidant and particle study (NEOPS): preliminary results from the Centerton, New Jersey, field site

Marley, N. A.; Gaffney, J. S.; Oct. 12, 2001; 6p; In English

Report No.(s): DE2001-789719; ANL/ER/CP-106011; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

During the summer of 1990, the Northeast Oxidant and Particle Study (NEOPS), as part of the North American Research Strategy for Tropospheric Ozone (NARSTO), investigated the factors leading to the occurrence of increased levels of ozone and fine particles during the summer months in the northeastern United States. The primary NEOPS air sampling station was located in the city of Philadelphia, Pennsylvania, at the Delaware River, northeast of the city center. Supplemental chemistry and meteorology measurements were taken at Centerton, New Jersey, a rural site 30 miles south of Philadelphia and 25 miles north of Delaware Bay. This paper reports the preliminary atmospheric chemistry and aerosol results obtained at the rural sampling site near Centerton. In particular, the nitrogen dioxide (NO2) and peroxyacetyl nitrate (PAN) data obtained with our second-generation luminol instrument are discussed and compared to results obtained with conventional nitrogen oxides (NO-y) measurements.

NTIS

Oxidizers; Particulates; Air Sampling; Nitrogen Dioxide; Nitrogen Oxides

20020030230 Argonne National Lab., IL USA

Historical overview of the development of chemiluminescence detection and its application to air pollutants

Gaffney, J. S.; Marley, N. A.; Oct. 10, 2001; 6p; In English

Report No.(s): DE2001-789718; ANL/ER/CP-106005; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

By necessity, the authors will surely slight someone in this overview of the use of chemiluminescent reactions to monitor air pollutants, but that will not be out of 'malice or flattery.' We take this opportunity to review some of the scientific efforts that have contributed to the discovery, understanding, and application of chemiluminescent reactions in atmospheric chemistry. Chemical reactions occur when atoms or molecules interact with sufficient energy to overcome the potential energy barrier for the reaction. In many cases, chemical reactions release energy in the form of light and heat. These are called exothermic reactions. A special case of an exothermic reaction in which light is produced without heat (or with minimal heat) is a chemiluminescent reaction. Some common examples of chemiluminescent chemistry have been known for ages; in their historical texts the ancient Greeks and Chinese reported chemiluminescence in biological systems. Indeed, emission of cold light is known to occur in a variety of biological organisms, the best known being the firefly. In this case an enzyme, luciferase (meaning light-bearing), reacts with oxygen in the firefly's abdomen to produce the familiar blue-green light. Fireflies are actually beetles (order Coleoptera, family Lampyridae). Other examples of bioluminescent organisms include bacteria and deep-sea fishes. The bioluminescence reactions can be considered a special case of chemiluminescences.

NTIS

Chemiluminescence; Air Pollution; Light Emission; Exothermic Reactions; Chemical Reactions

20020030236 Argonne National Lab., IL USA

Direct contact pyrolysis of methane using nuclear reactor heat

Lewis, M. A.; Serban, M.; Marshall, C. L.; Lewis, D.; Nov. 09, 2001; 12p; In English

Report No.(s): DE2001-789730; ANL/CMT/CP-106173; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An energy system based on fossil fuels is responsible for the generation of massive amounts of CO and CO2, (from oxidation of about 6 gigatons C per year), which is recognized as a threat to our environment. An alternate energy system based on hydrogen would be more environmentally benign but significant developmental work is required for commercial acceptability. These greenhouse gas emissions are recognized as a threat to our environment. The U.S. safely uses about 4 trillion cubic feet of H2, most of which is produced by the steam reforming of hydrocarbons, primarily methane (SMR). Two major disadvantages of the SMR technology are the concurrent generation of greenhouse gases and the energy costs. We are proposing to use direct contact pyrolysis (DCP) of methane/natural gas to minimize these disadvantages. In this process, methane is bubbled through a molten metal heated by the liquid metal coolant in Generation IV reactors to produce H2 and carbon, which is collected on the liquid metal surface. Coking of active sites does not occur. Proof-of-principle experiments were recently completed and critical experimental parameters were identified. Methane was converted to H2 and carbon when bubbled through lead at all temperatures studied, 600-900degC, without generating greenhouse gases. Conversion efficiency increased with temperature and residence time. The temperature dependence of the reaction was used to calculate the apparent energy of activation, 213 kJ/mol for temperatures between 750 and 900degC. This value is considerably lower than the bond dissociation energy of H-CH3 at 431 kJ/mol, indicating an autocatalytic reaction. The maximum conversion at 900degC was about 25%. Hydrogen is the only significant gaseous product in DCP, that is, the reaction, CH4-2H2+C goes to completion. No heavier gaseous hydrocarbons were observed. Results of tests with a commercial grade of natural gas were similar to those with methane, although the ethane in the natural gas was preferentially pyroloyzed. Currently we are identifying methods to increase conversion efficiency at lower temperatures, such as longer residence times.

NTIS

Natural Gas; Methane; Pyrolysis; Activation Energy; Methyl Compounds; Hydrocarbons; Exhaust Emission

20020030735 Kentucky Univ., Physics Dept., Lexington, KY USA

Theoretical Studies of Starburst Infrared Emission: Luminosity Indicators in Dusty Photoionized Environments *Final Report, 1 Apr. 1997 - 31 Mar. 2001*

Bottorff, Mark, Kentucky Univ., USA; LaMothe, Joseph, Kentucky Univ., USA; Momjian, Emmanuel, Kentucky Univ., USA; Verner, Ekaterina, Kentucky Univ., USA; Vinkovic, Dejan, Kentucky Univ., USA; Ferland, Gary J., Kentucky Univ., USA; Publications of the Astronomical Society of the Pacific; September 1998; Volume 110, pp. 1040-1045; In English

Contract(s)/Grant(s): NAG5-4235; NSF AST-96-17083; RTOP 762-98-06

Report No.(s): UK-4-60771; Copyright; Avail: Issuing Activity

The luminosity of the central source in ionizing radiation is an essential parameter in a photoionized environment and is one of the most fundamental physical quantities one can measure. We outline a method of determining the luminosity for any emission-line region using only infrared data. In dusty environments, grains compete with hydrogen in absorbing continuum radiation. Grains produce infrared emission, and hydrogen produces recombination lines. We have computed a very large variety of photoionization models, using ranges of abundances, grain mixtures, ionizing continua, densities, and ionization parameters. The conditions were appropriate for such diverse objects as H(II) regions, planetary nebulae, starburst galaxies, and the narrow- and broad-line regions of active nuclei. The ratio of the total thermal grain emission relative to H-Beta (IR/H-Beta) is the primary indicator of whether the cloud behaves as a classical Stroemgren sphere (a hydrogen-bounded nebula) or whether grains absorb most of the incident continuum (a dust-bounded nebula). We find two global limits: when IR/H-Beta is less than 100, infrared recombination lines determine the source luminosity in ionizing photons; when IR/H-Beta is greater than > 100, the grains act as a bolometer to measure the luminosity.

Author

Cosmic Dust; Hydrogen; Ionizing Radiation; Luminosity; Nebulae; Photoionization; Infrared Radiation

20020031148 Little (Arthur D.), Inc., Cupertino, CA USA

Demonstration of a Diesel Fuel-Borne Catalyst System and Low NOx Control Technology for Reducing Particulate and NOx Emissions *Final Report*

Jackson, M. D.; Remillard, R. L.; Jun. 28, 2001; 72p; In English

Report No.(s): PB2002-102318; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

The objective of this work was to demonstrate vehicle and emissions performance of an advanced diesel engine achieving low NOx and particulate (PM) emissions. Arthur D. Little, teamed with Rhodia and Cummins, proposed a cost-shared project to the SCAQMD and the ARB to develop and demonstrate, in vehicle applications, an EGR engine using Rhodia's cerium-based fuel additive and a particulate filter. The tradeoff of reducing NOx and PM is well known for diesel engines, and the concept proposed to reduce NOx with cooled EGR and to use a filter to trap the increased exhaust particulate. The Rhodia cerium-based catalytic diesel fuel additive was chosen to ensure filter regeneration by lowering the filter regeneration temperature. Rhodia had demonstrated their additive-filter technology in Europe, and had worked with Cummins on similar filter systems. What was new in this project was developing an engine system for both low-NOx and low-PM emissions performance. Cummins selected their B Series, 5.9L diesel engine for this project.
NTIS
Diesel Fuels; Catalysts; Combustion Products

20020031149 Science Applications International Corp., Raleigh, NC USA
Visibility in Mandatory Federal Class 1 Areas (1994-1998): A Report to Congress
Nov. 2001; 270p; In English
Report No.(s): PB2002-102272; No Copyright; Avail: National Technical Information Service (NTIS)
The national visibility goal was established in section 169A of the 1977 Clean Air Act (CAA) as 'the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Federal Class 1 areas which impairment results from manmade air pollution.' There are 156 mandatory Federal Class 1 areas identified for visibility protection under this provision. Section 169B of the 1990 CAA Amendments required EPA to issue a report to Congress estimating the visibility improvement expected in these 156 areas resulting from implementation of the 1990 Amendments. In October 1993, EPA issued its report entitled Effects of the 1990 Clean Air Act Amendments on Visibility in Class 1 Areas: An EPA Report to Congress (EPA 452/R-93-014). Section 169B also requires EPA to provide Congress with regular assessments of the actual progress and improvements in visibility in the mandatory Federal Class 1 areas. This document is the first report to Congress that reviews past progress. This report presents visibility trends and analyses of annual and seasonal pollutant composition based on 1994-1998 monitoring data from 46 sites.
NTIS
Visibility; Air Quality; Contaminants; Estimating; Prevention

20020031150 Georgia Inst. of Tech., Atlanta, GA USA
Ammonia Emissions from the EPA's Light Duty Test Vehicle
Shores, R. C.; Walker, J. T.; Jones, L. G.; Rodgers, M. O.; Pearson, J. R.; 2001; 20p; In English
Report No.(s): PB2002-102290; No Copyright; Avail: National Technical Information Service (NTIS)
The paper discusses measurements of ammonia (NH3) emissions from EPA's light-duty test vehicle while operated on a dynamometer. The vehicle's (1993 Chevrolet equipped with a three-way catalyst) emissions were measured for three transient (urban driving, highway fuel economy, and hard acceleration) cycles and steady state operation. Previous research showed that NH3 is predominantly emitted from vehicles with a catalyst (three-way or dual-bed). The normal operation of the vehicle's catalyst is to reduce nitrogen oxides (NO-x) to nitrogen (N2) and oxygen (O2). The reduction of NO-x to NH3 emissions were measured during fuel-rich/reduced-O2 conditions (open-loop control scheme), and the results indicated that NH3 production is correlated to combustion conditions. The results also indicated that the amount of NH3 produced correlations with the amount of time that the vehicle remains in the open-loop control scheme. The significance of this finding is that NH3 production can be predicted for a fleet based on the frequency of enrichment of vehicles equipped with a three-way catalyst. The results also provide a way to determine the location of roadway links and/or specific locations where NH3 production can be anticipated based on predicted engine power.
NTIS
Ammonia; Internal Combustion Engines; Emittance

20020031151 Environmental Protection Agency, National Risk Management Research Lab., Research Triangle Park, NC USA
Modeling Suppression of Dioxin Formation during Coal Combustion
Telfer, M. A.; Gullett, B. K.; 2000; 18p; In English
Report No.(s): PB2002-102294; EPA/600/A-01/117; No Copyright; Avail: National Technical Information Service (NTIS)
The paper discusses a homogeneous, gas-phase reaction mechanism that has been developed to explain sulfur (S) and chlorine (C1) interactions in an industrial, fire-tube boiler, using No. 2 fuel oil (0.03% S) doped with copper naphthenate (CuNA) and 1,2-dichlorobenzene (1,2-diC1Bz). The experiments were intended primarily for the investigation of polychlorinated

dibenzodioxin and furan (PCDD/F) formation. However, significant reduction of sulfur dioxide (SO2) from combustion of No. 2 fuel oil was also observed upon injection of 1,2-diC1Bz. Interaction between S and C1 has been of significant interest due to the potential of S to suppress the formation of PCDDs/Fs during cofired combustion of high-S coal with municipal waste (MW). A suggested mechanism is the gas-phase reaction SO2+C12+H20=S03+2HC1 that converts active molecular chlorine (C12)-formed in the post-flame zone by the metal-catalyzed Deacon process-to inactive hydrogen chloride (HC1). In this study, the gas-phase suppression reaction is represented by a series of elementary reaction steps compiled from previously validated reaction mechanisms. The model was able to explain the observed rapid conversion of S02 to S03 in the boiler experiments upon injection of 1,2-diC1Bz to a HC1 conversion of 60%. These results present a possible mechanism for gas-phase S and C1 interactions and a potential means of elucidating the S02 suppression mechanisms of PCDD/F formation during cofired combustion of high-S coal and MW.
NTIS
Combustion Products; Boilers; Chlorine; Doped Crystals; Reaction Kinetics

20020031765 Environmental Protection Agency, Clean Air Technology Center, Research Triangle Park, NC USA
Technical Bulletin: Refrigerated Condensers for Control of Organic Air Emissions
Dec. 2001; 30p; In English
Report No.(s): PB2002-101828; EPA/456/R-01/004; No Copyright; Avail: National Technical Information Service (NTIS)
This technical Bulletin describes both refrigeration and condensers that together form a control technology for organic emissions. These emissions may result from the evaporation of: Volatile Organic Compounds (VOC) that contribute to ozone formation in the troposphere; volatile organic Hazardous Air Pollutants (HAP) that may have a direct impact on our health and safety; or volatile stratospheric ozone depleting compounds. Terms like VOC and HAP are used in regulatory definitions to indicate specific chemical compounds and related emissions that are subject to a rule. The reasons for regulating specific groups of organic compounds may be very different. However, refrigerated condensers can be used to control vapors from most organic emissions that may be included in any of these regulatory definitions. The types of refrigeration discussed are: absorption refrigeration; mechanical compression refrigeration (using sulphur dioxide (SO2), chlorofluorocarbons (CFC) and hydrofluorocarbons (HFC)); Reverse Brayton Cycle refrigeration; and cryogenic (liquid nitrogen) cooling. This Technical Bulletin also discusses how a condenser operates, advantages and limitations for each type of refrigeration system, safety precautions that should be taken.
NTIS
Air Pollution; Control Equipment; Condensers (Liquefiers); Refrigerating Machinery; Chemical Composition; Chlorofluorocarbons

20020031769 Bureau of Reclamation, Technical Service Center, Denver, CO USA
Coating a Concrete Research Chamber Containing Hazardous Chemicals
Straubinger, R. E.; Dec. 2001; 42p; In English
Report No.(s): PB2002-102298; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Recently, the Bureau of Reclamation (Reclamation) and the Environmental Protection Agency (EPA) joined forces to design and construct a controlled spill research facility near Mercury, Nevada. Reclamation was asked to design a large concrete research chamber that would be used to study groundwater plume delineation and soil contamination resulting from surface and subsurface contamination. This will be accomplished by constructing an artificial, flowing aquifer inside a concrete chamber. This report discusses issues relating to coating or lining the inside of the concrete chamber. The report provides a summary of the issues related to selecting a coating or liner, requirements for each, issues related to specifying a surface profile required for a coating, areas where more information is needed, design considerations, and requirements that factor into the coating and/or lining design for the concrete chamber.
NTIS
Hazardous Wastes; Concretes; Environment Protection; Exhaust Gases; Reclamation; Soil Pollution

20020031771 Texas Univ., Center for Transportation Research, Austin, TX USA
Methodologies for Evaluating Environmental Benefits of Intelligent Transportation Systems, *Sep. 00 - Feb. 01*
Mehta, T.; Mahmassani, H. S.; Bhat, C.; May 2001; 58p; In English
Report No.(s): PB2002-102275; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report provides an overview of the current state of practice in evaluation of air quality impacts and also in emissions modeling. This report also describes the recent developments in emissions modeling. The air quality impacts of various ITS

strategies and technology bundles are also described in detail. Reported air quality benefits of various ITS projects are also presented.
NTIS
Air Quality; Bundles; Transportation; Transportation Networks

20020031780 Army Cold Regions Research and Engineering Lab., Hanover, NH USA
Physical and Chemical Factors Affecting Contaminant Hydrology in Cold Environments
Grant, S. A.; Dec. 2000; 42p; In English; Original contains color illustrations
Report No.(s): PB2002-102769; ERDC/CRREL-TR-00-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report surveys some of the physical and chemical effects of cold temperatures that should be considered when developing a contaminant-transport model. This discussion begins with a working definition of cold regions for the purpose of contaminant hydrology modeling: an area with appreciable frozen ground and with a substantial fraction of the annual precipitation falling as snow. The chemical thermodynamics of geochemical solutions below 0 (deg) C is then reviewed. Particular attention is placed on the physical-chemical properties of ice and liquid water at subzero temperatures. Finally, models that estimate the liquid water content and hydraulic conductivity of frozen ground are discussed.
NTIS
Chemical Properties; Physical Properties; Hydrology; Contaminants; Thermochemistry; Chemical Effects; Geochemistry

20020032583 Environmental Protection Agency, National Risk Management Research Lab., Research Triangle Park, NC USA
Elemental Mercury Adsorption by Activated Carbon Treated with Sulfuric Acid
Li, Y. H.; Serre, S. D.; Lee, C. W.; Gullett, B. K.; 2000; 14p; In English
Report No.(s): PB2002-102293; EPA/600/A-01/112; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The paper gives results of a study of the absorption of elemental mercury at 125 C by a sulfuric-acid (H2S04, 50% w/w solution)-treated carbon for the removal of mercury from flue gas. The pore structure of the sample was characterized by nitrogen (N2) at -196 C and the t-plot method analysis. Thermogravimetric analysis (TGA) was used to examine the thermal behaviors of the treated sample. Study results show that the H2S04-treated carbon has a very high elemental mercury capture capacity (27 mg/g) via a physisorption mechanism. The pore volume and surface area of the treated carbon were drastically reduced due to absorption of the H2S04 in the micropores of the carbon, resulting in a narrower microporosity.
NTIS
Adsorption; Mercury (Metal); Sulfuric Acid; Activated Carbon; Thermogravimetry; Carbon

20020032587 Geological Survey, Water Resources Div., Denver, CO USA
Methods of Analysis by the U.S. Geological Survey National Water Quality Laboratory: Determination of Pesticides in Water by Graphitized Carbon-Based Solid-Phase Extraction and High-Performance Liquid Chromatography/Mass Spectrometry
Furlong, E. T.; Anderson, B. D.; Werner, S. L.; Soliven, P. P.; Coffey, L. J.; 2001; 88p; In English
Report No.(s): PB2002-102113; USGS/WRI-01-4134; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
In 1996, the U.S. Geological Survey National Water Quality Laboratory (NWQL) developed and implemented a graphitized carbon-based solid-phase extraction and high-performance liquid chromatographic analytical method to determine polar pesticide concentrations in surface- and ground-water samples. Subsequently, the NWQL developed a complementary analysis that uses high-performance liquid chromotography/mass spectrometry to detect, identify, and quantify polar pesticides and pesticide metaboliltes in filtered water at concentrations as low as 10 nanograms per liter. This new method was designed to improve sensitivity and selectivity over the prior method, and to reduce known interferences from natural organic matter.
NTIS
Water Quality; Pesticides; Geological Surveys; Surface Water

20020032588 Environmental Protection Agency, Air Pollution Prevention and Control Div., Research Triangle Park, NC USA
Capstone Report on the Development of a Standard Test Method for VOC Emissions from Interior Latex and Alkyd Paints
Chang, J. C. S.; Nov. 2001; 192p; In English
Report No.(s): PB2002-101312; EPA/600/R-01/093; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The report gives details of a small-chamber test method, developed by the EPA for characterizing volatile organic compound (VOC) emissions from interior latex and alkyd paints. Current knowledge about VOC, including hazardous air pollutant, emissions from interior paints generated by tests based on this method are presented. Experimental data were analyzed to demonstrate the usefulness of the method and test results in terms of emission characterization, material selection, exposure

assessment, and emission reduction by product reformulation. The conclusions drawn from the Experimental results were used to develop a standard practice that is presented (as a draft) in an appendix to the report.
NTIS
Paints; Volatile Organic Compounds; Indoor Air Pollution; Latex; Air Pollution; Contaminants

20020032745 Georgia Inst. of Tech., Atlanta, GA USA
Project to Interface Climate Modeling on Global and Regional Scales with Earth Observing (EOS) Observations ***Final Report, 1 Jan. 2000 - 31 Dec. 2001***
Dickinson, Robert E., Georgia Inst. of Tech., USA; [2002]; 5p; In English
Contract(s)/Grant(s): NAG5-8880
Report No.(s): G-35-622; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
This ten-year NASA IDS project began in 1990. Its initial work plan adopted the NASA provided timeline that data would become available for new Earth Observing System (EOS) platforms beginning in 1995. Over its first phase, it was based at NCAR, which had submitted the original proposal and involved activities of a substantial number of co-investigators at NCAR who engaged in research over several areas related to the observations expected to be received from the EOS platforms. Their focus was the theme of use of EOS data for improving climate models for projecting global change. From the climate system viewpoint, the IDS addressed land, clouds-hydrological cycle, radiative fluxes and especially aerosol impacts, ocean and sea-ice, and stratosphere. Other research addressed issues of data assimilation, diagnostic analyses, and data set development from current satellite systems, especially use of SAR data for climate models.
Author
Climate Models; Earth Observing System (EOS); Hydrological Cycle

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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.

20020028000 Geological Survey, Reston, VA USA
Nature and Timing of Tectonism in the Western Facies Terrane of Nevada and California-An Outline of Evidence and Interpretations Derived from Geologic Maps of Key Areas
Ketner, K. B.; 1998; 30p; In English
Report No.(s): PB2002-102619; USGS-PP-1592; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Detailed geologic maps are one of the most important tools available to geologists for determining tectonic history. This report is essentially a critique of selected maps, most of which have been published since 1958 when currently accepted concepts of the tectonic history of the region were first formulated by R.J. Roberts and others. The purpose of this report is to highlight the most significant stratigraphic and structural relations displayed on these geologic maps, stressing the significance of the maps individually and collectively for the tectonic history of the region.
NTIS
Geological Surveys; Terrain; Geology

20020028012 Geological Survey, Reston, VA USA
Assessing Earthquake Hazards and Reducing Risk in the Pacific Northwest. Volume 2
Rogers, A. M.; Walsh, T. J.; Kockelman, W. J.; Priest, G. R.; 1998; 248p
Report No.(s): PB2002-102615; USGS-PP-1560; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
The articles in the Earthquake Hazards section of the professional paper discuss ground-shaking and ground-failure hazards and the estimation of losses associated with these hazards. Ground shaking and ground failure are the major factors in loss of life and property during earthquakes. The delineation of these hazards by mapping and site-specific prediction techniques is an important step in the process of reducing the effects of earthquakes. Ground-shaking and ground-failure maps, for example, can be valuable in land-use-policy development, siting or relocation of local government emergency facilities, and urban-renewal decisions. Furthermore, hazard maps can aid in the design and siting of lifelines and ordinary structures and in emergency planning and response, each requiring advance information about the likelihood of earthquake damage to infrastructure. Estimates of the magnitude of economic losses and mortality during future earthquakes are also partly based on hazard maps. Loss estimates are

not only useful in planning for earthquakes but also serve decision makers in establishing preventive actions and determining the rate at which resources should be expended to reduce earthquake effects.
NTIS
Earthquakes; Economics; Landforms; Hazards

20020028055 NASA Goddard Space Flight Center, Greenbelt, MD USA
Understanding Plasma Interactions with the Atmosphere: The Geospace Electrodynamic Connections (GEC) Mission
July 2001; 43p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 460-00-00
Report No.(s): NASA/TM-2001-209980; Rept-2001-01314-0; NAS 1.15:209980; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Geospace Electrodynamic Connections (GEC) mission is a multispacecraft Solar-Terrestrial Probe that has been specifically designed to advance the level of physical insight of our understanding of the coupling among the ionosphere, thermosphere, and magnetosphere. GEC is NASA's fifth Solar-Terrestrial Probe. Through multipoint measurements in the Earth's ionosphere-thermosphere (I-T) system, GEC will (i) discover the spatial and temporal scales on which magnetospheric energy input into the I-T region occurs, (ii) determine the spatial and temporal scales for the response of the I-T system to this input of energy, and (iii) quantify the altitude dependence of the response.
Author
Earth Ionosphere; Plasma Interactions; Thermosphere; Space Missions; Magnetosphere-Ionosphere Coupling

20020029280 Sandia National Labs., Albuquerque, NM USA
Modification of TOUGH2 to Include the Dusty Gas Model for Gas Diffusion
Webb, S. W.; Oct. 01, 2001; 28p; In English
Report No.(s): DE2001-789524; SAND2001-3214; No Copyright; Avail: Department of Energy Information Bridge

The GEO-SEQ Project is investigating methods for geological sequestration of CO2. This project which is directed by LBNL and includes a number of other industrial, university, and national laboratory partners, is evaluating computer simulation methods including TOUGH2 for this problem. The THOUGH2 code, which is a widely used code for flow and transport in porous and fractured media, includes simplified methods for gas diffusion based on a direct application of Fick's law. As shown by Webb (1998) and others, the Dusty Gas Model (DGM) is better than Fick's Law for modeling gas-phase diffusion in porous media. In order to improve gas-phase diffusion modeling for the GEO-SEQ Project, the EOS7R module in the TOUGH2 code has been modified to include the Dusty Gas Model as documented in this report. In addition, the liquid diffusion model has been changed from a mass-based formulation to a mole-based model. Modifications for separate and coupled diffusion in the gas and liquid phases have also been completed. The results from the DGM are compared to the Fick's law behavior for TCE and PCE diffusion across a capillary fringe. The differences are small due to the relatively high permeability (k=10-11 m2) of the problem and the small mole fraction of the gases. Additional comparisons for lower permeabilities and higher mole fractions may be useful.
NTIS
Carbon Dioxide; Vapor Phases; Liquid Phases; Geology

20020029291 Sandia National Labs., Albuquerque, NM USA
Interpreting Fracture Patterns in Sandstones Interbedded with Ductile Strata at the Salt Valley Anticline, Arches National Park, Utah
Lorenz, J. C.; Cooper, S. P.; Dec. 01, 2001; 52p; In English
Report No.(s): DE2001-789591; SAND2001-3517; No Copyright; Avail: Department of Energy Information Bridge

Sandstones that overlie or that are interbedded with evaporitic or other ductile strata commonly contain numerous localized domains of fractures, each covering an area of a few square miles. Fractures within the Entrada Sandstone at the Salt Valley Anticline are associated with salt mobility within the underlying Paradox Formation. The fracture relationships observed at Salt Valley (along with examples from Paleozoic strata at the southern edge of the Holbrook basin in northeastern Arizona, and sandstones of the Frontier Formation along the western edge of the Green River basin in southwestern Wyoming), show that although each fracture domain may contain consistently oriented fractures, the orientations and patterns of the fractures vary considerably from domain to domain. Most of the fracture patterns in the brittle sandstones are related to local stresses created by subtle, irregular flexures resulting from mobility of the associated, interbedded ductile strata (halite or shale). Sequential episodes of evaporite dissolution and/or mobility in different directions can result in multiple, superimposed fracture sets in the associated sandstones. Multiple sets of superimposed fractures create reservoir-quality fracture interconnectivity within restricted localities of a formation. However, it is difficult to predict the orientations and characteristics of this type of fracturing in the

subsurface. This is primarily because the orientations and characteristics of these fractures typically have little relationship to the regional tectonic stresses that might be used to predict fracture characteristics prior to drilling. Nevertheless, the high probability of numerous, intersecting fractures in such settings attests to the importance of determining fracture orientations in these types of fractured reservoirs.
NTIS
Sandstones; Fractures (Materials); Sedimentary Rocks; Halites

20020029847 Los Alamos National Lab., NM USA
Modeling shock recovery experiments of sandstone
Hagelberg, C. R.; Swift, R. P.; Jul. 01, 1999; 5p; In English
Report No.(s): DE2001-786010; LA-UR-99-3353; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present results from mesoscale modeling of shock recovery experiments on Berea sandstone with the Smooth Particle Hydrodynamics and the Discrete Element methods. Each grain is represented with clusters of Discrete Element particles to provide explicit representation of the grain and pore structure. The grain structures simulate the structures observed using synchrotron micro tomography and Scanning Electron Microscope imaging. The modeling accounts for the influence of pore fluid and illustrates how grain/pore heterogeneity under dry and saturated states affects stress wave and grain damage behavior. The simulations show characteristics of the phenomena observed in recovery experiments. An increase in grain damage coincides with an increase in stress level and pulse duration. The grains in dry samples are extremely and irregularly fragmented with extensively reduced porosity. Less grain damage and higher porosity is observed in the saturated samples. The influence of pore fluid mitigates the interaction between grains, thus reducing fragmentation damage. This modeling approach in concert with experiments offers a unique way to understand dynamic compaction of brittle porous materials.
NTIS
Atmospheric Models; Mesoscale Phenomena; Fragmentation; Sandstones; Stress Waves

20020029852 Los Alamos National Lab., NM USA
Analysis of shock damage to Berea sandstone using SEM images of samples from impact recovery experiments
Hagelberg, C. R.; Hiltl, M.; Nov. 01, 1999; 9p; In English
Report No.(s): DE2001-787309; LA-UR-99-5838; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A series of impact recovery experiments have been conducted on dry, water-saturated (wet), and water-pressurized Berea sandstone samples using a single stage light gas gun. The samples are subjected to various stress levels using a flyer plate impact. The recovered samples provide a large database of Scanning Electron Microscope (SEM) images depicting the damage. Laser particle size analyses are also being conducted on portions of the recovered samples to characterize changes in grain size distribution. We present the characteristics of the recovered samples using the SEM for selected examples for each of the experimental categories. We also present some preliminary statistical analysis of the SEM images of the samples to assess variations in damage.
NTIS
Sandstones; Light Gas Guns; Grain Size; Statistical Analysis; Size Distribution

20020030130 Sydney Univ., School of Physics, Australia
Stochastic Growth of Ion Cyclotron and Mirror Waves In Earth's Magnetosheath
Cairns, Iver H., Sydney Univ., Australia; Grubits, K. A., Sydney Univ., Australia; Physical Review E; [2001]; ISSN 1063-651X; Volume 64, pp. 056408-1 - 056408-4; In English
Contract(s)/Grant(s): NAG5-6369; Copyright; Avail: Issuing Activity
Electromagnetic ion cyclotron and mirror waves in Earth's magnetosheath are bursty, have widely variable fields, and are unexpectedly persistent, properties difficult to reconcile with uniform secular growth. Here it is shown for specific periods that stochastic growth theory (SGT) quantitatively accounts for the functional form of the wave statistics and qualitatively explains the wave properties. The wave statistics are inconsistent with uniform secular growth or self-organized criticality, but nonlinear processes sometimes play a role at high fields. The results show SGT's relevance near marginal stability and suggest that it is widely relevant to space and astrophysical plasmas.
Author
Stochastic Processes; Ion Cyclotron Radiation; Magnetosheath

20020031761 Colorado Univ., Lab. for Atmospheric and Space Physics, Boulder, CO USA
Studies of Tropical/Mid-Latitude Exchange Using UARS Observations ***Final Report, 1 Dec. 1997 - 30 Nov. 2001***
Avallone, Linnea, Colorado Univ., USA; [2001]; 4p; In English
Contract(s)/Grant(s): NAG5-6629; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

At the time this proposal was submitted, recent publications had suggested an important role for transport of midlatitude air into the tropical lower stratosphere. Most of these studies had employed data that gave only a time-averaged picture, making it difficult to determine the nature of the transport processes responsible for the observed behavior. We proposed to analyze observations of long-lived trace gases, such as nitric acid, methane, nitrous oxide, and chlorofluorocarbons, made from the Upper Atmosphere Research Satellite, to investigate the seasonal behavior of mixing between the midlatitudes and tropics. We planned to construct probability distributions of the concentrations of these species over small altitude ranges and to compare them to expectations based on modeled mean concentrations and knowledge of instrument precision. Differences from expectation were to be analyzed with respect to meteorological parameters to determine whether wave activity may have induced apparent mixing. Derived from text

Probability Distribution Functions; Stratosphere; Trace Elements; Atmospheric Circulation; Mixing

20020032335 Army Research Lab., Sensors Directorate, Adelphi, MD USA
NATO Advanced Research Workshop on the Optics of Cosmic Dust
Videen, Gorden; Nov. 2001; 79p; In English
Report No.(s): AD-A398792; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Biological warfare (BW) agents are a prime concern to both military and civilian personnel because of both their lethality and the resulting terror they would inflict upon a population. DC testing and identifying aerosols is a primary objective of the US DoD and many other institutions worldwide. Light scattering may provide an automated means of rapidly detecting and identifying potentially lethal aerosols real-time without the use of chemical reagents or expensive maintenance. Since organic particles tend to fluoresce, many detector systems have focused on measuring this property to identify potentially harmful particles to raise an alarm. However, because fluorescence signals tend to be weak and smooth, it is difficult to differentiate among species of biological particles. Natural backgrounds vary widely and may cause false alarms. For this reason, other information is needed about the particle system that may be gathered from the elastic scattering spectrum. One property of 3W agents is that when they are aerosolized, they tend to aggregate into clusters. From the scattering signal, it might be possible to characterize the individual spores making up the cluster to help in the identification. However, again it is essential to be aware of the natural background signals caused by dust, diesel fumes, pollen, etc. and to develop methods to distinguish between these particles and the particles of concern.
DTIC

Biological Weapons; Cosmic Dust; Defense Program; North Atlantic Treaty Organization (NATO); Optics

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20020027234 Massachusetts Univ., Microwave Remote Sensing Lab., Amherst, MA USA
Millimeter-Wave Radar Cloud Measurements and Data Analysis for Satellite Validation ***Final Report, 29 Aug. 1996-30 Sep. 1997***
Sekelsky, Stephen M.; May 31, 1998; 6p; In English
Contract(s)/Grant(s): F19628-96-C-0146
Report No.(s): AD-A398479; AFRL-VS-TR-2001-1665; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The University of Massachusetts operated a Cloud Profiling Radar System in Everglades City, Fla., for three weeks during September 1996. On-site calibration of the radar was performed with a trihedral comer reflector. Time-height measurements of reflectivity, Doppler mean velocity, Doppler velocity variance, and linear depolarization ratio were assembled into netCDF datafiles for further analysis and comparison with data from other sensors. The data were archived in the Phillips Laboratory Data Archive Center and were made available through the Worldwide Web on a university web site.
DTIC

Meteorological Radar; Cloud Physics; Millimeter Waves

20020027533 Kyushu Univ., Faculty of Engineering, Fukuoka, Japan

Remote Sensing of Wind Velocity by Boundary Layer Radar

Hayashida, Hidetoshi, Kyushu Univ., Japan; Maeda, Junji, Kyushu Univ., Japan; Technology Reports of Kyushu University; January 2002; ISSN 0023-2718; Volume 75, No. 1, pp. 39-46; In Japanese; Copyright; Avail: Issuing Activity

Recently, with increase of high-rise building, information about a wind profile at a high altitude of over 500m is more strongly requested for its wind resistant design. 'A boundary layer radar' is used to measure the wind data of such a high altitude. However, its principal purpose is for meteorological observation. and so the observation of the atmospheric boundary layer within the altitude of about 500m is very few. In this paper, the wind data measured by the boundary layer radar and the data by ordinary windmill anemometers are compared. And some results of the strong wind measurements of the altitude of 200 to 2000m are reported and the wind profiles of the high altitude are discussed.

Author

Atmospheric Boundary Layer; Meteorological Radar; Remote Sensing; Wind Profiles

20020027701 Texas A&M Univ., College Station, TX USA

Climatological Lightning Characteristics of the Southern Rocky and Appalachian Mountain Chains, A Comparison of Two Distinct Mountain Effects

Phillips, Stephen E.; Dec. 07, 2001; 153p; In English

Report No.(s): AD-A398512; CI01-310; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This study presents a high-resolution lightning climatology for southern portions of both the Rocky Mountains and the Appalachian Mountains. Data from the National Lightning Detection Network (NLDN) are analyzed to produce maps of average annual lightning flash density, positive flash density, percent positive flashes, median peak current, and multiplicity. Three-hourly increments are used to demonstrate the annual average diurnal evolution of flash density. Data are also divided into seasonal averages for the same three-hourly increments to describe the daily evolution of flash density for each of the four seasons: December-January-February, March-April-May, June-July-August, and September-October-November. The flash density analyses reveal opposite mountain-valley effects. In the Rocky Mountains, flash density enhancements occur over and near mountains and flash density minima occur in the valleys. In the Appalachians, the enhancements occur in the valleys, while minimums are noted over the mountains. The eastern edge of the Appalachian lightning suppression is determined to be a result of faster propagation of mountain- initiated convection. Weaker mountain breezes in the Appalachians are theorized to be the catalysts for this. The western edge of the suppression is the cumulative effect of consistent flash density gradients at the Appalachian's western slopes. A theory is presented which links this gradient to observations of high median peak currents. Statistical tests on flash density means show that the Appalachian suppression is significant. Multiple regressions predict lightning flash density from terrain characteristics. Vertical wind and thermodynamic profiles, horizontal temperature differences at summit levels, and average annual precipitation complete the study. From these data, a conceptual model is presented to describe the nature of the lightning evolution in each region, and explain the processes that lead to the end state.

DTIC

Appalachian Mountains (North America); Climatology; Lightning; Thermodynamics; Precipitation (Meteorology)

20020027884 Meteorological Satellite Center, Kiyose, Japan

Monthly Report of the Meteorological Satellite Center: October 2001

October 2001; In English; CD-ROM conforms to the ISO 9660 standard for volume and file structure; Copyright; Avail: Issuing Activity

The CD-ROM concerning the October 2001 Monthly Report of the Meteorological Satellite Center (MSC) contains the observation data derived from the Geostationary Meteorological Satellite (GMS) of Japan and the Polar Orbital Meteorological Satellites operated by NOAA. The CD-ROM contains the following observation data: Full Disk Earth's Cloud Image; Cloud Image of Japan and its vicinity; Cloud Amount; Sea Surface Temperature; Cloud Motion Wind; Water Vapor Motion Wind; Equivalent Blackbody Temperature; OLR (Out-going Longwave Radiation), Solar Radiation; Snow and Ice Index; Orbit Data; Attitude Data; VISSR Image Data Catalog (Cartridge Magnetic Tape (CMT), Micro Film); TOVS (TIROS Operational Vertical Sounder) Vertical Profile of Temperature and Precipitable Water; and TOVS Total Ozone Amount.

Derived from text

Satellite Observation; Satellite Sounding; Atmospheric Sounding; Meteorological Parameters; Satellite Imagery; Japan

20020027885 NASA Goddard Space Flight Center, Greenbelt, MD USA

Impact of Albedo Contrast Between Cirrus and Boundary-Layer Clouds on Climate Sensitivity

Chou, Ming-Dah, NASA Goddard Space Flight Center, USA; Lindzen, R. S., Massachusetts Inst. of Tech., USA; Hou, A. Y., NASA Goddard Space Flight Center, USA; [2001]; 11p; In English

Contract(s)/Grant(s): DE-FG02-01ER-63257; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In assessing the iris effect suggested by Lindzen et al. (2001), Fu et al. (2001) found that the response of high-level clouds to the sea surface temperature had an effect of reducing the climate sensitivity to external radiative forcing, but the effect was not as strong as LCH found. This weaker reduction in climate sensitivity was due to the smaller contrasts in albedos and effective emitting temperatures between cirrus clouds and the neighboring regions. FBH specified the albedos and the outgoing longwave radiation (OLR) in the LCH 3.5-box radiative-convective model by requiring that the model radiation budgets at the top of the atmosphere be consistent with that inferred from the Earth Radiation Budget Experiment (ERBE). In point of fact, the constraint by radiation budgets alone is not sufficient for deriving the correct contrast in radiation properties between cirrus clouds and the neighboring regions, and the approach of FBH to specifying those properties is, we feel inappropriate for assessing the iris effect. Derived from text

Albedo; Cirrus Clouds; Climate; Sensitivity; Boundary Layers

20020028887 NASA Goddard Space Flight Center, Greenbelt, MD USA

Raman Lidar Water Vapor Measurements at the DOE SGP CART Site

Whiteman, David N., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; Water Vapor Intensive Operational Periods Meeting, 28-29 Nov. 2001, Madison, WI, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA/GSFC Scanning Raman Lidar (SRL) was deployed to the Department of Energy's (DOE) Cloud and Radiation Testbed site in northern Oklahoma September - December, 2000 for two DOE sponsored field campaigns: 1) the Water Vapor Intensive Operations Experiment 2000 and 2) the Atmospheric Radiations Measurement First International Satellite Cloud Climatology Experiment Experiment (AFWEX). WvIOP2000 focussed on water vapor measurements in the lower troposphere while AFWEX focussed on upper tropospheric water vapor. For the first time ever, four water vapor lidars were operated simultaneously: one airborne and three ground-based systems. Intercomparisons of these measurements and others will be presented at the meeting.

Author

Water Vapor; Climatology; Raman Spectroscopy; Optical Radar; Measuring Instruments

20020028889 NASA Goddard Space Flight Center, Greenbelt, MD USA

Impact of Quikscat Data on Numerical Weather Prediction

Atlas, Robert; Ardizzone, J.; Bloom, S.; Brin, G.; Bungato, D.; Jusem, J. C.; Terry, J.; Yu, T.-W.; [2001]; 1p; In English; 2001 AGU Fall Meeting, 10-14 Dec. 2001, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Scatterometer observations of the ocean surface wind speed and direction improve the depiction and prediction of storms at sea. These data are especially valuable where observations are otherwise sparse ---mostly in the Southern Hemisphere and tropics, but also on occasion in the North Atlantic and North Pacific. The SeaWinds scatterometer on the QuikScat satellite was launched in July 1999 and it represents a dramatic departure in design from the other scatterometer instruments launched during the past decade (ERS-1,2 and NSCAT). The NASA Data Assimilation Office (DAO) was the first data assimilation center to assimilate QuikScat SeaWinds data and evaluate their impact on numerical weather prediction. Several data impact experiments have been performed, using systems from both the DAO (GEOS-3) and from NCEP (GDAS). In general, these experiments have shown a modest impact of SeaWinds data on numerical weather prediction, the magnitude of which appears to be comparable to the magnitude of the impact of AMI scatterometer data from the ERS satellites. Some of the main results from these experiments will be presented at the meeting.

Author

Numerical Weather Forecasting; Scatterometers; Ocean Surface; Storms (Meteorology); Data Acquisition

20020028890 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Transfer Function Model as a Tool to Study and Describe Space Weather Phenomena

Porter, Hayden S., Furman Univ., USA; Mayr, Hans G., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; 2001 Fall AGU Meeting, 10-14 Dec. 2001, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Transfer Function Model (TFM) is a semi-analytical, linear model that is designed especially to describe thermospheric perturbations associated with magnetic storms and substorm. activity. It is a multi-constituent model (N2, O, He H, Ar) that accounts for wind induced diffusion, which significantly affects not only the composition and mass density but also the temperature and wind fields. Because the TFM adopts a semianalytic approach in which the geometry and temporal dependencies of the driving sources are removed through the use of height-integrated Green's functions, it provides physical insight into the essential properties of processes being considered, which are uncluttered by the accidental complexities that arise from particular source geometrie and time dependences. Extending from the ground to 700 km, the TFM eliminates spurious effects due to arbitrarily chosen boundary conditions. A database of transfer functions, computed only once, can be used to synthesize a wide range of spatial and temporal sources dependencies. The response synthesis can be performed quickly in real-time using only limited computing capabilities. These features make the TFM unique among global dynamical models. Given these desirable properties, a version of the TFM has been developed for personal computers (PC) using advanced platform-independent 3D visualization capabilities. We demonstrate the model capabilities with simulations for different auroral sources, including the response of ducted gravity waves modes that propagate around the globe. The thermospheric response is found to depend strongly on the spatial and temporal frequency spectra of the storm. Such varied behavior is difficult to describe in statistical empirical models. to improve the capability of space weather prediction, the TFM thus could be grafted naturally onto existing statistical models using data assimilation.

Author

Mathematical Models; Space Weather; Transfer Functions; Weather Forecasting; Perturbation

20020029259 Argonne National Lab., IL USA

Atmospheric Radiation Measurement Program facilities newsletter, November 2001

Holdridge, D. J.; Dec. 04, 2001; 2p; In English

Report No.(s): DE2001-789679; ANL/ER/NL-01-11; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The official weather outlook for the upcoming winter season from the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center is for a winter very similar to last years. Without the influence of the El Nino southern oscillation (ENSO), winter weather patterns will be variable. The absence of the El Nino and La Nina climate patterns allows other climate factors to prevail. Two factors are the Arctic oscillation, which controls the numbers of cold air outbreaks in the South and Nor'easters on the East Coast, and the Madden-Julian oscillation, which influences the number of heavy rain storms and floods in the Pacific Northwest. National Weather Service (NWS) forecasters use improved technology to predict exactly how these climate factors will affect the nation's winter weather extremes. Forecasters are expecting large temperature and precipitation swings across the nation this winter, with wet and mild weather specifically for the Southern Great Plains states.

NTIS

Atmospheric Radiation; Weather Forecasting; Atmospheric Temperature; Precipitation (Meteorology)

20020029265 NASA Wallops Flight Center, Wallops Island, VA USA

Data Comparison: Satellite and Falling Sphere Temperatures

Schmidlin, Francis J., NASA Wallops Flight Center, USA; Schauer, Allison G., NASA Wallops Flight Center, USA; Remsberg, Ellis E., NASA Langley Research Center, USA; [2001]; 1p; In English; 2001 Fall AGU Meeting, 10-14 Dec. 2001, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA

Report No.(s): AGU-00857090; No Copyright; Avail: Issuing Activity; Abstract Only

Small meteorological rocketsondes providing temperature data have beam used for comparison with, and validation of measurements from satellite-borne instruments. A significant number of rocket-borne falling spheres were launched in conjunction with the Upper Atmosphere Research Satellite (UARS) for validation of the Halogen Occultation Experiment (HALOE), High Resolution Doppler Interferometer (HRDI), and the Microwave Limb Sounder (MLS) instruments. Upper stratosphere and mesosphere temperatures measured with these instruments on UARS are compared with inflatable spheres launched from Wallops Island (1992-1999), Brazil (1994), Hawaii (1992), Norway (1992), and Sweden (1993 and 1996). Time and space differences varied between the satellite measurement and the rocketsonde launch, for example HALOE overpasses occurred within 5 days and in some cases there were spatial differences of up to 30 degrees longitude. Validation measurements of the HRDI instrument occurred at Wallops Island when it passed within 20 minutes and 330 kilometers of the launch site. Because of discontinuity in the falling sphere drag coefficients when fall speed neared MACH 1 falling sphere temperatures near 70 kilometers attitude are biased toward lower temperatures. Availability of improved software and a new atmospheric model have helped to reduce this bias. The validated remote instrument measurements permit a new perspective of atmospheric structure to

be formed, not always possible with the limited number of falling sphere measurements. Features of the remote measurement temperature profiles and their possible use to extend the climatological data base at the rocketsonde sites will be discussed.
Author
Climatology; Satellite-Borne Instruments; Sounding Rockets; Remote Sensing; Data Bases

20020030196 Center for Mathematics and Computer Science, Amsterdam Netherlands
Sparse-Grid Combination Technique Applied to Time-Dependent Advection Problems. Modelling, Analysis and Simulation
Lastdrager, B.; Koren, B.; Verwer, J. G.; Oct. 31, 1999; 28p; In English
Report No.(s): PB2002-103680; MAS-R9930; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
In the numerical technique considered in this paper, time-stepping is performed on a set of semi-coarsened space grids. At given time levels the solutions on the different space grids are combined to obtain the asymptotic convergence of a single, fine uniform grid. We present error estimates for the two-dimensional spatially constant-coeffcient model problem and discuss numerical examples. A spatially variable-coeffcient problem (Molenkamp-Crowley test) is used to assess the practical merits of the technique. The combination technique is shown to be more efficient than the single-grid approach, yet for the Molenkamp-Crowley test, standard Richardson extrapolation is still more effcient than the combination technique. However, parallelization is expected to significantly improve the combination technique's performance.
NTIS
Advection; Computational Grids; Convergence

20020030311 National Center for Atmospheric Research, Climate and Global Dynamics Div., Boulder, CO USA
Interaction of the Climate System and the Solid Earth: Analysis of Observations and Models ***Final Report***
Bryan, Frank, National Center for Atmospheric Research, USA; December 2001; 4p; In English
Contract(s)/Grant(s): NAG5-6549
Report No.(s): NCAR-1996-153; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Under SENH funding we have carried out a number of diverse analyses of interactions of the climate system (atmosphere, ocean, land surface hydrology) with the solid Earth. While the original work plan emphasized analysis of excitation of variations in Earth rotation, with a lesser emphasis on time variable gravity, opportunities that developed during the proposal period in connection with preparations for the GRACE mission led us to a more balanced effort between these two topics. The results of our research are outlined in several topical sections: (1) oceanic excitation of variations in Earth rotation; (2) short period atmosphere-ocean excitation of variations in Earth rotation; (3) analysis of coupled climate system simulation; (4) observing system simulation studies for GRACE mission design; and (5) oceanic response to atmospheric pressure loading.
Author
Air Water Interactions; Climate; Earth Rotation; Ocean Surface; Oceanography

20020032232 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Fire Regimes and Climatic Indicators: Relationships in the USA
Hettinga, Jennifer A.; Jan. 2001; 102p; In English; Original contains color images
Report No.(s): AD-A398892; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Relationships between annual fire data and climate data from 1984-1997 were examined for ten states across the U.S. The data used included annual fire data from the U.S. Forest Service and monthly precipitation and Palmer drought severity index (PDSI) values from the National Oceanic and Atmospheric Administration (NOAA). Correlation tests were performed to find variables that showed statistical significant at the alpha = 0.05 level. All states tested showed statistically significant correlations between multiple fire and climate data sets. The exact data sets showing high levels of correlation varied from state to state. Arizona had a high positive correlation between winter precipitation and PDSI values and fire activity for fires of medium size over the time period studied. All other states showed negative correlations between various precipitation or PDSI values and fire activity. In many cases, more PDSI values showed high correlations to fire activity than precipitation values. It was found that, in general, the most extreme annual drought conditions were highly correlated with fire activity. Also, the largest fires (Classes F and G) were linked to precipitation or the Palmer index in fewer states than fires of medium sizes.
DTIC
Forest Fires; Climate

20020032339 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

The Paleoclimate of the Dead Sea Basin from the Last Glacial Maximum to the Holocene

Swoveland, Thomas K.; Nov. 2001; 95p; In English; Original contains color images

Report No.(s): AD-A398818; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this study was to determine the late glacial paleoclimate of the Southern Levant. A study of delta C-13 and delta O-18 in carbonates (aragonite) was undertaken from a Lisan Core 3, a laminated core, collected from the Lisan Peninsula in the Dead Sea. Accelerator Mass Spectrometer (AMS) ages demonstrated that the core spanned the period from the Last Glacial Maximum (LGM) to the Holocene (20-12 thousand years ago (kya)). Results derived from carbon and oxygen isotopes provide insight into the paleoclimate of the Southern Levant. The period from 20-14.6 kya was dry and cool, with little organic matter being washed into the Dead Sea Basin. This interpretation is based on higher isotopic values (delta C-13 values as high as 1.57) than are found in the modern Jordan River, which has delta C-13 values of -7.2. During the interval from 14.2-12.5 kya, values for delta C-13 and delta O-18 were much more dilute, with delta C-13 values as low as -14. This dilution demonstrates increased precipitation and/or flooding events that washed organic matter into the basin. The results of this study agree with other studies based on paleolake levels, pollen levels and paleoclimate studies from the Dead Sea Basin.

DTIC

Structural Basins; Paleoclimatology; Organic Materials

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.

20020027240 Naval Research Lab., Ocean Sciences Branch, Bay Saint Louis, MS USA

Software Design Description for the Advanced Circulation Model for Shelves, Coastal Seas, and Estuaries (ADCIRC)

Blain, Cheryl A.; Kelly, Kimberly A.; Dec. 21, 2001; 126p; In English

Report No.(s): AD-A398470; NRL/MR/7320--01-8271; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The purpose of this Software Design Description (SDD) is to describe the software design and code of the Advanced Circulation Model for Shelves, Coastal Seas, and Estuaries (ADCIRC) The structure of the code is outlined using flow charts with details of the input and output files included. Detailed descriptions of the programs, subprograms, and common blocks are provided. Information regarding specification of input files and the implementation of the setup code are also included. Specifics on the model theory and a detailed user manual with advice on parameter selection are referenced.

DTIC

Software Engineering; Computer Programs; Ocean Models

20020027704 Louisiana State Univ., Coastal Marine Inst., Baton Rouge, LA USA

Investigation of Pressure and Pressure Gradients along the Louisiana/Texas Inner Shelf and Their Relationships to Wind Forcing and Current Variability ***Final Report, 1 Oct. 1994 - 31 Dec. 1999***

Walker, N. D.; Jaroscz, E.; Murray, S. P.; Aug. 2001; 58p; In English

Report No.(s): PB2002-101923; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this study, six pressure gauges were installed along the Louisiana/Texas inner shelf to enable a detailed investigation of the alongshore pressure and pressure gradients and their relationships to wind forcing and coastal circulation along the Louisiana/Texas coast. A semi-annual cycle in sub-surface pressure/water level was detected in the monthly mean pressure data along the Louisiana and Texas inner shelves. Mean monthly pressure maxima were measured in October with secondary maxima in April/May. The pressure minima were observed in January/February with secondary minima in July/June. These seasonal pressure changes were closely associated with seasonal changes in alongshore wind forcing. A more detailed analysis of the water level fluctuations on the synoptic scale revealed that the highs and lows in water levels were attributed to one or more distinct wind events within each month. Statistical analyses of the relationships between pressure and wind stress revealed that at all stations and in both summer and winter seasons, highest coherences were observed between the alongshore wind stress and sub-surface pressure variations. Based on this study, we conclude that the barotropic pressure gradients along the coast do not provide a major control on current variability except in the west portion of the study region during the summer. Long period oscillations in

pressure/water level were detected along the Louisiana/Texas coastline during the 1996 summer, an observation that suggests the existence of coastal trapped waves.
NTIS
Annual Variations; Coasts; Pressure Gradients; Wind Shear; Oceanography

20020027705 Louisiana State Univ., Coastal Marine Inst., Baton Rouge, LA USA
Dispersion in Broad, Shallow Estuaries: A Model Study
Inoue, M.; Wiseman, W. J.; Park, D.; Justic, D.; Stone, G.; Jul. 2001; 76p; In English
Report No.(s): PB2002-101924; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Specifically, this report covers the following subjects: (1) a comparative model study of Barataria Basin, Louisiana, to delineate the role of wind forcing on flushing dispersion characteristics; (2) an enhancement of the two-dimensional depth-integrated hydrodynamic model to include baroclinic pressure gradient; (3) the preliminary results of the first field deployment in Terrebonne Bay to measure currents and suspended sediments. The purpose of the field deployment is to document the role of waves and currents on sediment resuspension and eventually allow development and calibration of a suspended sediment module to be coupled to the hydrodynamic model. Significant role of wind forcing on flushing and dispersion characteristics of Barataria Basin is clearly demonstrated for the typical summer condition investigated. Flushing times for various subbasins were shorter by 20-40% under wind forced conditions compared to without wind. The impact of wind forcing becomes more prominent where the tidal energy is higher and the local geomorphology is complex. An accurate advection scheme is employed for advective transport of temperature and salinity.
NTIS
Baroclinity; Flushing; Sediments; Wind Effects; Estuaries

20020027713 Continental Shelf Associates, Inc., Jupiter, FL USA
Mississippi/Alabama Pinnacle Trend Ecosystem Monitoring: Final Synthesis Report ***Final Report, 1 Oct. 1996 - 30 Jul. 01***
Oct. 2001; 507p; In English
Contract(s)/Grant(s): 1445-CT09-96-0006
Report No.(s): PB2002-101921; Rept-1600-41; USGS-BSR-2001-0007; OCS-Study-MMS-2001-080; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche
This final Synthesis Report summarizes an oceanographic field program to characterize and monitor hard bottom features on the Mississippi/Alabama outer continental shelf. Based on previous studies and new geophysical reconnaissance, nine sites in the Mississippi/Alabama 'pinnacle trend' area were selected for monitoring. These sites were sampled intensively during four monitoring cruises over a two-year period. Moorings with sediment traps, current meters, other oceanographic instruments, and settling plates were also deployed at four of the sites. Monitoring program components included geological characterization, sediment dynamics, geochemistry, physical oceanography and hydrography, hard bottom communities, fish communities, and two companion studies (microhabitat studies and epibiont recruitment). For each component, the report presents field and laboratory methods, results, and discussion. A synthesis chapter draws together finding from all program companies.
NTIS
Characterization; Ecosystems; Geophysics; Oceanography; Environmental Monitoring

20020028362 Smithsonian Institution, Washington, DC USA
Ostracoda ('Myodocopina') from Bahamian Blue Holes
Kornicker, L.; Ilife, T. M.; Harrison-Nelson, E.; 2002; 112p; In English
Report No.(s): PB2002-102488; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Three troglobitic myodocopid ostracodes (two previously described and one new) in the Order Halocyprida are reported from anchialine waters in inland blue holes on Grand Bahama Island and Andros Island. The adult male and female Deeveya bransoni Kornicker and Palmer, 1987, described and illustrated, a key is presented to species of Deeveya, and the sexual dimorphism and ontogeny of the genus is discussed.
NTIS
Marine Biology; Ontogeny; Islands; Protobiology

20020030136 National Center for Atmospheric Research, Climate and Global Dynamics Div., Boulder, CO USA
Establishing an IERS Sub-Center for Ocean Angular Momentum ***Final Report***
Bryan, Frank, National Center for Atmospheric Research, USA; December 2001; 3p; In English
Contract(s)/Grant(s): NAG5-7698
Report No.(s): NCAR-1997-179; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The primary responsibilities of the NCAR component of this project are the following: (1) Acting as liaison with the international ocean modeling community; and (2) Developing standardized algorithms to compute desired ocean model products, and providing template source code for these algorithms in widely used global ocean models.
Derived from text
Algorithms; Ocean Models; Angular Momentum

20020030207 National Oceanic and Atmospheric Administration, Environmental Technology Lab., Boulder, CO USA
Satellite and Skin Layer Effects on the Accuracy of Sea Surface Temperature Measurements from the GOES Satellites
Wick, Gary A., National Oceanic and Atmospheric Administration, USA; Bates, John J., National Oceanic and Atmospheric Administration, USA; Scott, Donna J., Colorado Univ., USA; [2000]; 53p; In English
Contract(s)/Grant(s): NAG5-6521; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The latest Geostationary Operational Environmental Satellites (GOES) have facilitated significant improvements in our ability to measure sea surface temperature (SST) from geostationary satellites. Nonetheless, difficulties associated with sensor calibration and oceanic near-surface temperature gradients affect the accuracy of the measurements and our ability to estimate and interpret the diurnal cycle of the bulk SST. Overall, measurements of SST from the GOES Imagers on the GOES 8-10 satellites are shown to have very small bias (less than 0.02 K) and rms differences of between 0.6 and 0.9 K relative to buoy observations. Separate consideration of individual measurement times, however, demonstrates systematic bias variations of over 0.6 K with measurement hour. These bias variations significantly affect both the amplitude and shape of estimates of the diurnal SST cycle. Modeled estimates of the temperature difference across the oceanic cool skin and diurnal thermocline show that bias variations up to 0.3 K can result from variability in the near-surface layer. Oceanic near-surface layer and known ”satellite midnight” calibration effects, however, explain only a portion of the observed bias variations, suggesting other possible calibration concerns. Methods of explicitly incorporating skin layer and diurnal thermocline effects in satellite bulk SST measurements were explored in an effort to further improve the measurement accuracy. While the approaches contain more complete physics, they do not yet significantly improve the accuracy of bulk SST measurements due to remaining uncertainties in the temperature difference across the near-surface layer.
Author
GOES Satellites; Sea Surface Temperature; Temperature Measurement; Algorithms; Accuracy; Synchronous Platforms

20020031763 Texas A&M Univ., Research Foundation, College Station, TX USA
Spatial and Temporal Variability of Plankton Stocks on the Basis of Acoustic Backscatter Intensity and Direct Measurements in the Northeastern Gulf of Mexico ***Final Report, Sep. 1998 - Apr. 2001***
Scott, R. L.; Biggs, D. C.; DiMarco, S. F.; Aug. 2001; 142p; In English
Report No.(s): PB2002-101926; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
To investigate the utility of Acoustic Doppler Current Profilers (ADCPs) for estimating the spatial and temporal variability of zooplankton stocks in the northeastern Gulf of Mexico, acoustic data from a moored array of ADCPs were used in conjunction with sea truth zooplankton samples. As part of the DeSoto Canyon Eddy Intrusion Study, twelve Broadband ADCPs were moored along four cross-margin lines in the DeSoto Canyon area of the northeastern Gulf of Mexico. These upward-looking ADCPs were moored at approximately 90-m depth and deployed March 1997 through April 1999. to obtain sea truth for the backscatter data, net tows were made during spring, summer, and fall of 1998 as well as spring 1999.
NTIS
Zooplankton; Acoustic Properties; Spatial Distribution; Temporal Distribution; Sound Detecting and Ranging

20020031767 Louisiana State Univ., Coastal Marine Inst., Baton Rouge, LA USA
Improved Geohazards and Benthic Habitat Evaluations: Digital Acoustic Data with Ground Truth Calibrations ***Final Report***
Roberts, H. H.; Jul. 2001; 188p; In English
Report No.(s): PB2002-102143; MMS-2001-050; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche
The study was undertaken with the intent of producing a practical guide for interpreting geohazards, particularly those associated with hydrocarbon seepage and venting, and the presence or absence of associated chemosynthetic communities. In the

course of conducting this investigation, fundamental knowledge about the linkage between slope geology, seepage rate, and biologic response has emerged. This new appraisal of the impacts of hydrocarbon seepage and venting on slope geology and biology is discussed in the summary sections of this report. In addition, the strong influence of high quality 3D-seismic data on geohazards evaluations is discussed along with the variability of seafloor types that produce a common response as acoustic wipe-out zones on high resolution seismic profiles. Interpretation criteria are still evolving, but the most rigorous interpretation scheme is available in this final report.
NTIS
Underwater Acoustics; Biological Effects; Digital Data; Physiological Responses; Calibrating

20020031768 Louisiana State Univ., Coastal Marine Inst., Baton Rouge, LA USA
Wind and Eddy-Related Circulation on the Louisiana/Texas Shelf and Slope Determined from Satellite and In-situ Measurements
Walker, N. D.; Mar. 2001; 80p; In English
Report No.(s): PB2002-102142; OCS-MMS-2001-025; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
In this study, NOAA satellite sea surface temperature measurements, TOPEX and ERS-1 sea-surface height anomalies, surface drifter data and current meter measurements are analyzed to improve the understanding of circulation processes in the northwestern Gulf of Mexico. The tracks of drifters from October 1993 through January 1994 were studied in relation to the locations of shelf fronts and warm-core and cold-core eddies. Four main circulation patterns were identified with the coastal current circulation being the most dominant. Other circulation patterns were attributable to the slop eddies. LATEX-A current meter measurements, drifter data and satellite data were used to understand the seasonal change in shelf circulation patterns. The datasets were also used to investigate in detail the summer upwelling regime along the southern Texas coastline, its relationships to wind forcing and slope eddies.
NTIS
Air Water Interactions; Atmospheric Temperature; Upwelling Water; Satellite Sounding

20020031788 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden
Analysis of Transmission Loss Data with JEPE-S and a Genetic Algorithm
Andersson, B. L.; Dec. 1999; ISSN 1104-9154; 32p; In English
Report No.(s): PB2002-102172; FOA-R-99-01375-409-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report describes model analyses of transmission loss (TL) as function of range and depth observed in Karlmarsund in the Baltic. The parameters of a layered seabed of solid materials are adjusted to match the observed and modelled TL data at six frequencies ranging from 20 Hz to 160 Hz. The JEPE-S wide-angle PE code for range-dependent fluid-solid media is used as forward model, and the seabed parameters are search with a Genetic Algorithm (GA) executing in parallel mode on a network of workstations. With a range-independent seabed model, the goodness of match is found to be similar to that achieved in previous inversions of the same data sets with GA and an accurate full-field wave-propagation code. With the seabed modelled as a range-dependent layered solid, the goodness of match was improved distinctly over previously achieved GA inversion results. For instance, a deep local minimum in the TL at range 2500 m present in the data at the lowest frequency 20 Hz only, is captured reasonably well by the seabed model produced by the inversion.
NTIS
Genetic Algorithms; Transmission Loss; Wave Propagation

20020031789 TechLaw, Inc., Bethesda, MD USA
Assessment of Historical, Social, and Economic Impacts of OCS Development on Gulf Coast Communities, Volume 2, Narrative Report
Wallace, B.; Kirkley, J.; McGuire, T.; Austin, D.; Goldfield, D.; Apr. 2001; 552p; In English
Report No.(s): PB2002-102144; OCS/MMS-2001-027-Vol-2; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche
The objective of this study is to enhance the understanding and document the relationship between Outer Continental Shelf (OCS) development and the economies, communities and households of the GOM region. The study examines regional change in the GOM since 1930 and the offshore oil industry's role in those changes. to do this, the study: Identifies social and economic trends and compares and contrasts these trends with the region and the nation; Analyzes factors behind the trends; Contextualizes the findings in terms of the history of the South and appropriate comparative literature. This is the second part of a two-phased project to provide a baseline of the social and economic consequences of OCS development on Gulf Coast communities.
NTIS
Economic Development; Offshore Energy Sources; Continental Shelves; Crude Oil; Economic Impact

20020033022 Scripps Institution of Oceanography, La Jolla, CA USA

Estimating the Ocean Flow Field from Combined Sea Surface Temperature and Sea Surface Height Data ***Final Report***

Stammer, Detlef, Scripps Institution of Oceanography, USA; Feb. 08, 2002; 6p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG5-8901; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project was part of a previous grant at MIT that was moved over to the Scripps Institution of Oceanography (SIO) together with the principal investigator. The final report provided here is concerned only with the work performed at SIO since January 2000. The primary focus of this project was the study of the three-dimensional, absolute and time-evolving general circulation of the global ocean from a combined analysis of remotely sensed fields of sea surface temperature (SST) and sea surface height (SSH). The synthesis of those two fields was performed with other relevant physical data, and appropriate dynamical ocean models with emphasis on constraining ocean general circulation models by a combination of both SST and SSH data. The central goal of the project was to improve our understanding and modeling of the relationship between the SST and its variability to internal ocean dynamics, and the overlying atmosphere, and to explore the relative roles of air-sea fluxes and internal ocean dynamics in establishing anomalies in SST on annual and longer time scales. An understanding of those problems will feed into the general discussion on how SST anomalies vary with time and the extend to which they interact with the atmosphere. Derived from text

Flow Distribution; Ocean Dynamics; Ocean Models; Sea Surface Temperature; Anomalies; Variability

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.

20020027220 National Bureau of Economic Research, Inc., Cambridge, MA USA

Breast Cancer: Treatment, Outcomes, and Cost-Effectiveness ***Final Report, 1 Jun. 1996-31 May 2000***

McClellan, Mark B.; Jun. 2000; 46p; In English

Contract(s)/Grant(s): DAMD17-96-1-6017

Report No.(s): AD-A398496; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project was to: (1) assess the validity of medical claims information for tracking breast cancer diagnoses, treatments, and outcomes; (2) use Medicare data, linked SEER cancer registry data, and claims data from large firms to analyze trends in diagnosis rates and staging, treatment, expenditures, and outcomes for Americans with breast cancer; and (3) analyze the cost effectiveness of alternative patterns of breast cancer diagnosis and treatment. The first part of Section B reviews the work done on creating cohorts of breast cancer patients and assessing the validity of the selection procedure. The second part discusses our findings on trends in breast cancer costs, treatments, and outcomes with a particular emphasis on changes in the productivity of breast cancer care. The third part reviews our work on measuring the cost effectiveness of alternative patterns of diagnosis and treatment, and introduces some innovative statistical methods we developed to help address the problem of bias. The conclusion section reviews the main findings and describes the areas for future research identified by this project.

DTIC

Cancer; Cost Effectiveness; Diagnosis; Mammary Glands

20020027222 Michigan Univ., Ann Arbor, MI USA

Identification of Components of the Cell Death Pathway ***Final Report, 1 Jun. 1996-31 May 2001***

Vincenz, Claudius; Jun. 2001; 82p; In English; Original contains color images

Contract(s)/Grant(s): DMD17-96-1-6085

Report No.(s): AD-A398498; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The inability of wt-Huntington expressed in C. elegans indicates that its anti-apoptotic function affects non-conserved aspects of Caspase-9 activation. We established a cellular model for the apoptotic signaling of p75NTR. The conditionally immortalized neuronal cells used is the first system in which p75NTR induces apoptosis in the absence of any co-stimuli. The tools are now in hand to identify the intracellular signaling components involved in transmitting the apoptotic signal from this receptor. A close homologue of p75NTR, NRADD, was also characterized. Despite its close homology, NRADD signals apoptosis by a different mechanism. Its activity is controlled by N-glycosylation and dominant negative constructs interfere with apoptotic stimuli generated at the endoplasmatic reticulum. Transgenic expression of the viral PAN-death receptor inhibitor ES protected mice from excitatory damage induced by kainic acid. This observation is highly relevant for neurodegenerative diseases like multiple

sclerosis where excitatory and immune mediated damage is observed. New insight into the assembly of death domain complexes was obtained by analyzing published structures of death domains heterodimeres. It emerges that death domains can interact in such a way to mediate multivalent interactions and not only monovalent associations as currently thought.
DTIC
Apoptosis; Cells (Biology); Neurology; Diseases; Proteins

20020027224 Howard Univ., Washington, DC USA
Diet, Genetic Polymorphisms and Breast Cancer in African-Americans ***Annual Report, 8 Sep. 2000-7 Sep 2001***
Adams-Campbell, Lucile L.; Oct. 2001; 82p; In English
Contract(s)/Grant(s): DAMD17-98-1-8110
Report No.(s): AD-A398502; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Dietary fat and cooking practices, such as overcooking of meats that can lead to the formation of heterocyclic amines (HAAs) and polycyclic aromatic hydrocarbons (PAHs), differ by racial groups and culture. The project is a case control study designed to assess the role of dietary fat, cholesterol, cooking practices (i.e. of fatty foods that would increase HAAs and PAHs), smoking, and alcohol consumption as risk factors for breast cancer among African- American women in Washington, DC. The primary goal of the project is to identify non-hormonal dietary risk and genetic susceptibility factors for breast cancer in African-American women. to date a total of 74 breast cancer cases and 40 controls have completed the study. The conditional response rate is 43% for cases and 10% for controls. The refusal rate is 10% for cases and 3% for controls. A total of 62% of the breast cancer cases have been ascertained. Also, genotyping and cholesterol analysis are currently being conducted.
DTIC
Cancer; Genetics; Mammary Glands; Polymorphism; Culture (Social Sciences); Africa

20020027226 University of Southern California, Los Angeles, CA USA
The Effect of a Moderate Aerobic Exercise Training Program on Ovarian Function ***Final Report, 1 Sep. 1996-31 Aug. 2000***
Peters, Ruth K.; Sep. 2000; 18p; In English
Contract(s)/Grant(s): DAMD17-96-1-6013
Report No.(s): AD-A398506; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There is substantial evidence to suggest that estrogens play a key role in the etiology of breast cancer. Both cross-sectional studies of highly trained athletes and prospective studies of high intensity exercise training programs have found a higher frequency of anovulation, lower levels of estradiol and in some cases a shortened luteal phase length with associated lower estradiol levels among these women. However, little is known about the effects of moderate intensity exercise on ovarian function. The aim of this study was to investigate the relationship between a moderate intensity exercise training program and ovarian function. Specifically, we aimed: 1) to determine whether changes occurred in frequency of ovulation as a result of a 6 month exercise training program, 2) to determine whether changes occurred in serum E2 levels in ovulatory and anovulatocycles in these women, and 3) to determine the luteal phase menstrual cycle lengths of these women as a result of the training program. We have completed data collection on 58 women. The analysis of this study will be completed as soon as the hormone analyses are completed.
DTIC
Cancer; Ovaries; Estrogens; Physical Exercise; Mammary Glands

20020027232 North Carolina Univ., Chapel Hill, NC USA
Actions and Substrates for the HER4 Tyrosine Kinase in Breast Cancer ***Final Report, 1 Jul. 1996-30 Jun. 2001***
Earp, H. S.; Jul. 2001; 100p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-96-1-6015
Report No.(s): AD-A398494; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The EGF receptor family consists of four members (EGFR and HER 2, 3, and 4). One, HER2, is overexpressed in 20-25% of human breast cancers through gene amplification while another, the EGF receptor, is thought to be overexpressed or activated in poor prognosis breast cancers. Our objective was to determine whether the most recently discovered member, HER4, triggers a distinct, anti-proliferative and differentiation signal in breast cell lines and could therefore be a marker breast cancer with a better prognosis. After cloning the HER4 cDNA and constructing various chimeric and mutant receptors, we created novel breast cell lines expressing a variety of molecular constructs. These were used to conclusively demonstrate that HER4 activation stimulated anti-proliferative and differentiation responses in breast cell lines, even in the absence of HER2 signaling. Thus, HER4 is both necessary and sufficient to slow the growth of breast cancer cell lines. Studies in the last year allowed development of microarray technology to delineate the effect of HER4 signaling alone as compared to combined HER2, HER3, HER4 signaling in the control

of gene expression. The experiments using the cell lines developed for this project have been performed, and hybridizations to 10,000 cDNA chip arrays have taken place. These arrays are awaiting bioinfomatic analysis. Lastly, we have investigated the role of EGFR vIII as a regulator breast cancer tumorigenesis. We have shown EGFR vIII is capable of phosphorylating HER4 when co-expressed by transfection but does not appear to do so in the context of overexpression in breast cancer cell lines.
DTIC
Cancer; Mammary Glands; Substrates; Tyrosine; Receptors (Physiology)

20020027233 Pittsburgh Univ., Pittsburgh, PA USA
Targeting of the Hepatocyte Growth Factor Pathway for the Treatment for Breast Cancer ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Siegfried, Jill M.; Sep. 2001; 23p; In English; Original contains color images
Report No.(s): AD-A398478; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Hepatocyte growth factor (HCF), also known as Scatter Factor, induces cell growth and cell movement, and is known to promote invasiveness of malignant cells. It also promotes angiogenesis. HGF is known to be produced by fibroblasts within breast tumors, while its receptor, the c-Met protein, is expressed on the breast tumor cells themselves. HGF thus appears to act predominantly as a paracrine factor in breast cancer. High levels of HGF expression within breast tumors correlates with an aggressive tumor phenotype, and HGF has been found to be a powerful negative prognostic indicator for breast cancer. Expression of the c-Met protein by breast tumors in culture also correlates with an estrogen receptor negative phenotype and with loss of estrogen-dependent cell growth.! Thus the HGF-c-Met ligand-receptor system may be important in controlling cell growth in breast tumors that have escaped estrogen regulation, a common occurrence in breast cancer patients who have lost responsiveness to anti-estrogen therapy. The hypothesis to be tested in this Idea Grant is that interruption of the HGF-c-Met signaling pathway will inhibit the growth of estrogen-independent human breast cancer cells and could be a useful therapeutic strategy for breast cancer patients who have failed endocrine therapy. We will use two approaches for these studies: (1) an anti-sense strategy that uses vectors constructed in the U6 RNA expression plasmid and delivered by cationic liposomes and (2) a recombinant HGF antagonist molecule (truncated HGF/tHGF) produced in baculovirus and delivered through injection to the peritumoral area.
DTIC
Mammary Glands; Cancer

20020027235 Missouri Univ., Columbia, MO USA
Combinatorial Approach to the Isolation of Human Antibodies Fragments and Peptides to Breast Carcinomas ***Final Report, 1 Sep. 1998-1 Sep 2001***
Deutscher, Susan; Oct. 2001; 25p; In English
Contract(s)/Grant(s): DAMD17-98-1-8320
Report No.(s): AD-A398482; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The focus of this research is to generate and characterize novel human antibody fragments (Fabs) and peptides that bind breast cancer cells. A combinatorial approach is being taken to generate immunoglobulin Fab that recognize a specific determinant on breast cancer cells including the breast cancer-associated Thomsen-Friedenreich (T) glycoantigen. In addition, human Fab and peptides will be generated from combinatorial libraries that bind breast cancer cells, irrespective of defined cell surface markers. The hypothesis that is implicit in these studies is that combinatorial approaches will provide Fab and peptides specific to either defined or ill-defined antigens present on breast cancer cells. The goals of this study are to: (1) generate human IgG Fab that bind specifically to the T antigen expressed on breast cancers from pre-existing Fab, (2) isolate Fab that bind ductal and lobular breast carcinoma cell lines from human combinatorial phage Fab display libraries, and (3) isolate peptides that bind breast carcinoma cell lines from combinatorial phage peptide display libraries. Results suggest phage libraries can yield Fab and scFv that bind to T antigen. Peptides and Fab that recognize lobular and ductal breast cancer cells are presently being sought.
DTIC
Mammary Glands; Cancer

20020027237 Minnesota Univ., Minneapolis, MN USA
Molecular Regulation of Immune Recognition Molecule Expression by Breast Cancer Cells ***Final Report, 1 Sep. 1997-31 Aug. 2001***
Burns, Linda J.; Sep. 2001; 68p; In English
Contract(s)/Grant(s): DAMD17-97-1-7022
Report No.(s): AD-A398485; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Novel anti-tumor strategies are required for breast cancer. We hypothesize that immunotherapy used in a minimal residual disease setting, such as can be obtained following stem cell transplantation, may prevent relapse of disease. Natural killer (NK) cells reconstitute the bone marrow beginning 3-4 weeks following an autologous transplant. We determined that NK cells can be activated with exogenous interleukin-2 (IL-2) to kill breast cancer targets. In order to improve and develop new strategies of immunotherapy, we investigated the mechanisms of NK cell recognition and lysis of breast cancer targets. We found multiple mechanisms to be involved, including beta 2 integrins, CD2, and LFA-2 and Herceptin antibody dependent cytotoxicity (ADCC) . We have further investigated our ability to maximize the activation of NH cells by IL-2 in collaborative laboratory studies in the context of clinical trials. We have demonstrated IL-2 administration during stem cell mobilization enhances the immunologic potential of the graft, and that we can markedly enhance the NH lytic activity towards breast cancer targets in the post-autologous transplant period by subcutaneous IL-2 administration followed by either IL-2 activated lymphocyte infusion or bolus IL-2. A clinical trial studying our ability to translate a laboratory finding of IL-2/Herceptin ADCC into patient treatment is ongoing.
DTIC
Immune Systems; Immunology; Mammary Glands; Cancer

20020027239 Scripps Research Inst., La Jolla, CA USA
Extracellular Matrix in Breast Cancer Invasion ***Final Report, 1 Jun. 1998-31 May 2001***
Quaranta, Vito; Jun. 2001; 67p; In English
Contract(s)/Grant(s): DAMD17-98-1-8150
Report No.(s): AD-A398487; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The overall goal of our project is to identify novel treatments for breast cancer invasion and metastasis. We view invasion and metastasis as a breakdown of mechanisms that specify tissue organization. We postulated that metastasis is initiated by molecular cues that improperly stimulate cancer cell motility. Therefore, our approach is to block metastasis by understanding, and then interfering with, molecular and cellular mechanisms that regulate cell motility. We found that, in the mammary gland, several of these mechanisms revolve around the interaction of matrix metalloproteinases (MMP) with laminin-5 (Ln-5), an extracellular matrix macromolecule of the breast gland basal lamina. Our major findings are as follows: (1) identification of the Ln-5 site onto which cells adhere and migrate; (2) mapping, relative to this cell adhesion site, of a docking site for antibodies that block cell motility; (3) mapping of Ln-5 sites that are cleaved by MMPs; and (4) identifying the composition of the Ln-5 fragments resulting from this proteolytic MMP activity. This information should aid the design of reagents for in vivo animal experiments in which to test the ability of antibodies to Ln-5, or Ln-5 fragments, to hopefully block breast cancer cell motility and metastasis.
DTIC
Cancer; Locomotion; Mammary Glands; Metastasis

20020027245 Cancer Inst. of New Jersey, New Brunswick, NJ USA
Genetic Susceptibility to Cancer Chemotherapy in Human Breast Cancer ***Final Report, 1 Jul. 1998-30 Jun. 2001***
Hait, William N.; Jul. 2001; 56p; In English
Contract(s)/Grant(s): DAMD17-98-1-8043
Report No.(s): AD-A398401; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Previously CINJ (Cancer Institute of New Jersey) showed that MAP4, MRP and stathinin are regulated by the tumor suppressor protein, p53. These proteins play roles in microtubule dynamics as well as transport of chemotherapeutic drugs. In the past year CINJ focused on stathmin's role in cell cycle control and drug sensitivity. Stathmin destabilizes microtubule polymers through interactions with tubulin heterodimers. Since several chemotherapeutic agents used in the treatment of breast cancer target microtubule components, stathmin may play a role in determining sensitivity to these drugs. This is particularly important since stathmin is often upregulated in breast cancer. CINJ's current studies show that overexpression of stathmin leads to decreased microtubule polymerization and decreased sensitivity to both vinblastine and paclitaxel. This was intriguing given the concurrent increased cellular association of vinblastine. Cell lines overexpressing stathmin were more likely to enter G2 but less likely to enter mitosis as measured by mitotic figure counts. These data suggest that stathmin-mediated arrest may block chemotherapeutic drugs that are active in mitotic cells. These studies also suggest that mutant p53 breast cancer exhibiting high levels of stathmin may not be fully responsive to antimicrotubule agents in the face of an intact G2/M check point.
DTIC
Cancer; Chemotherapy; Genetics; Mammary Glands; Proteins

20020027249 New Jersey Medical School, Piscataway, NJ USA

Dual-Specificity Anti-HER-2/neu Antisense DNA Agents for Breast Cancer Therapy ***Final Report, 1 Jul. 1997-30 Jun. 2001***

Stein, Stanley; Jul. 2001; 119p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-97-1-7288

Report No.(s): AD-A398337; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The high level expression in some breast cancers of HER-2/neu correlates with poor prognosis. An antisense agent capable of down-regulating expression of this gene should be useful in treating these cancers. to achieve high avidity and specificity, we designed chimeric antisense molecules consisting of a short active DNA fused to a short 'anchor' 2'-0-methyl RNA complementary to non-contiguous single-stranded sequences in the 5'-UTR of HER-2/neu. DNA hexamers were tested for their ability to mediate RNaseH cleavage. The two most potent sequences were chosen as the active and anchor partners, and they were linked using spacers of various lengths. Besides these dimeric antisense agents, we attempted to further increase potency with trimeric oligonucleotides comprising of one 'active' and two 'anchor' oligonucleotides complementary to three non-contiguous sequences. We tested the ability of both dimeras and trimeras to down-regulate expression of the luciferase reporter gene placed downstream of the HER-2/neu 5'-UTR in wheat germ cell-free extracts. While dimeras successfully decreased expression at 1 micrometer, trimeras, surprisingly, were stimulatory at 1 micrometer for luciferase activity. Since both were equally potent in promoting RNA degradation of HER-2/neu mRNA in the RNaseH assay, this finding could be a clue to the mechanism that is responsible for HER-2/neu overexpression. We are now examining this phenomenon in breast cancer cell lines. In separate studies, we have developed and obtained a United States patent on a carrier polymer that can potentially provide oral bioavailability and enhanced cellular/cytosolic uptake into cells for antisense therapeutics.

DTIC

Cancer; Deoxyribonucleic Acid; Mammary Glands; Ribonucleic Acids

20020027251 Massachusetts Inst. of Tech., Cambridge, MA USA

A Novel Monoallelically Expressed Candidate Tumor Suppressor Gene for Breast Carcinogenesis on Chromosome 11p.15.5 ***Annual Report***

Preisinger, Elizabeth; Housman, David E.; Jul. 2001; 11p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-99-1-9277

Report No.(s): AD-A398593; 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 part in local and regional gene regulation at the imprinted domain on chromosome 11p.

DTIC

Cancer; Mammary Glands; Tumors; Suppressors; Carcinogens

20020027253 Cancer Therapy and Research Foundation, San Antonio, TX USA

Enhancing Well-Being During Breast Cancer Recurrence ***Annual Report, 1 Jun. 2000-31 May 2001***

Coltman, Charles A.; Jul. 2001; 20p; In English

Contract(s)/Grant(s): DAMD17-96-1-6009

Report No.(s): AD-A398587; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Significant numbers of breast cancer patients will experience a recurrence of their disease. Breast cancer recurrence is a time of enormous crisis, with significant distress, depression, and symptomatology, and few effective coping strategies. Targeted support services are currently unavailable. This study tests the hypothesis that patients experience greater well-being by participating in an intervention designed for breast cancer patients experiencing a first recurrence. Following pilot study phase, 300 breast cancer patients will be enrolled within 6 weeks post-recurrence. All participants are Southwest Oncology Group (SWOG) institutions. The women will be randomly assigned to a control group or an intervention to be carried out by Y-Me, a national breast cancer support and advocacy organization. The intervention consists of 4 to 8 structures sessions providing information and peer support delivered by breast cancer survivors via telephone over a 4 week period. Endpoints are assessed at baseline and 3 and 6 months later through validated quality of life and depression questionnaires. This study provides information

about improving well-being during a little studied portion of the breast cancer trajectory. The intervention is delivered by individuals who are well-qualified to provide support: women who themselves have experienced breast cancer recurrence. The project utilizes a cost-effective approach with the potential for wide-scale dissemination.
DTIC
Signs and Symptoms; Cancer; Mammary Glands; Survival; Females

20020027257 Cleveland Clinic Foundation, Cleveland, OH USA
Computer Assisted Minimally Invasive Surgery ***Final Report, 15 Sep. 1998-14 Jul. 2001***
Hahn, Joseph F.; Aug. 2001; 16p; In English
Contract(s)/Grant(s): DAMD17-98-1-8645
Report No.(s): AD-A398580; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Operating Room of the Future will deliver the optimal surgical environment through the integration of people, equipment, space and process. The Computer Assisted Minimally Invasive Surgery (CAMIS) project has completed the development and deployment of a number of components critical to the achievement of The Operating Room of the Future concept. The first component is a Digital Micro Encoscope (DME). This device provides endoscopic visualization of orthopaedic joint spaces. Coupled with its integrated video processing components, the DME enables a medical diagnosis of possible orthopaedic abnormalities through an incision size less than 2mm. The second component of the CAMIS project is a Patient Resource Database (PRD). This system constitutes a surgical data collection system coupled with a search mechanism which integrates other hospital data repositories into a unified interface. The system is referred to as the Electronic Surgical Record (ESR) and functions like an Operating Room ”aeronautical black box” recording critical aspects of the ensuing procedure. The third component of the CAMIS project is a Personal Surgical Display (PSD). This component provides the user with an augmented reality display of patient data during the performance of a surgical procedure. The design of the system enables a see through capability which allows the physician to reference their patient with respect to any data that is shown.
DTIC
Surgery; Computer Aided Design; Applications Programs (Computers)

20020027258 Sunnybrook and Women’s Coll. Health Sciences Centre, Toronto, Ontario Canada
A Novel Technique for Percutaneous Vertebroplasty in the Treatment of Metastatically Involved Vertebral Bodies ***Final Report, 1 Sep. 2000-31 Aug. 2001***
Whyne, Cari M.; Sep. 2001; 18p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0693
Report No.(s): AD-A398583; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Metastatic disease to the spine occurs in up to one third of all cancer patients. Over 50% of spinal metastases with neurologic manifestations in females are found to arise from primary breast neoplasms. Percutaneous vertebroplasty is a minimally invasive procedure designed to provide stability to structurally weakened vertebrae due to osteoporosis or lytic lesions. In percutaneous vertebroplasty, clinically significant complications occur predominantly in patients with spinal metastases. We proposed that this higher complication rate may be due to generation of elevated intervertebral pressures and movement of tumor tissue during the prophylactic (pre-fracture) injection of cement into vertebral bodies containing highly incompressible lytic lesions. We hypothesized that removing tumor prior to or during the injection of bone cement can reduce pressures and tumor extravasation. Consequently, this may improve the filling pattern, resulting in improved spinal stability. This work aims to develop a novel method for percutaneous tumor ablation and to quantify its ability to improve vertebroplasty results in metastatically involved vertebrae. The results of this study will provide a basis for clinical investigations into the improvement of vertebroplasty techniques and outcomes for patients treated prophylactically for spinal metastases.
DTIC
Clinical Medicine; Surgery; Vertebrates; Cancer; Metastasis; Spine; Mammary Glands

20020027259 Case Western Reserve Univ., Cleveland, OH USA
A Novel Apoptotic Protease Activated in Human Breast Cancer Cells After Poisoning Topoisomerase I ***Final Report, 15 Sep. 1998-14 Sep 2001***
Boothman, David A.; Oct. 2001; 78p; In English
Contract(s)/Grant(s): DAMD17-98-1-8260
Report No.(s): AD-A398569; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The goal of this grant was to clone the unknown protease activated by the active anti-breast cancer agent, beta-lapachone (beta-lap). The research team showed for the first time that beta-lap required NQ0l, a two-electron reductase elevated in many

human breast cancers, for activation. The team then identified the unknown apoptotic protease activated in human breast cancer cells by beta-lap, defining biological endpoints specific for a non-caspase-mediated apoptotic event. The unknown protease: (a) is a non-caspase cysteine protease; (b) cleaves p53, lamin B, and PARP (atypically) in an NQ0l-dependent manner at a time co-incident with calpain activation (appearance of an 18 kDa active form and its movement into the nucleus by confocal microscopy); (c) is calcium-dependent (e. g., the proteolytic cleavage of PARP or p53 was blocked by co-administration of EUTA or EDTA), and the drug causes massive NQ0l-dependent calcium influx within 3 mins posttreatment with 5-8 micro beta-lap; and (d) inhibited by calpastatin, a specific endogenous inhibitor of calpain. We have, therefore, concluded that the unknown protease activated in NQ0l-expressing human breast cancer cells is calpain.
DTIC
Enzymes; Ethylenediaminetetraacetic Acids; Apoptosis; Cancer

20020027263 Sunnybrook and Women's Coll. Health Sciences Centre, Toronto, Ontario Canada
Assessment of the Viscoelastic Properties of Normal and Abnormal Breast Tissue ***Annual Report, 1 Jul. 2000-30 Jun. 2001***
Plewes, Donald B.; Jul. 2001; 24p; In English
Contract(s)/Grant(s): DAMD17-99-1-9391
Report No.(s): AD-A398560; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

It is well known that variations in biomechanical properties of breast tissue are associated with the presence of disease. As a result, it is thought that stiffness represent an attractive property by which to detect disease and aid in differentiation between normal and benign breast tissues. Over the past few years, a number of investigators have attempted to measure breast tissue biomechanical properties based on ex-vivo tissue samples. These studies suggest the presence of large variations in breast tissue elastic modulus among various breast tissues. These data, however, are subject to sampling errors arising from tissue heterogeneity within the tissue samples and potential differences arising from ex-vivo conditions and tissue sample handling. As a result, repeatable measurements have been hard to achieve and the obtained data are thus less reliable. Our goal in this project is 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 uniaxial loading systems, an MRI-based and table-top system. Also, we developed various inverse solution algorithms for reconstruction of elastic modulus using MRI derived displacement data. During our second year, we have integrated, optimized and tested the table-top system. Using animal tissues, this system has proven to be accurate and reliable, and we are in the process of starting measurements on breast tissues. In addition, we have developed and optimized a novel constrained elastography technique which will be used in-vivo breast tissue modulus measurement.
DTIC
Viscoelasticity; Tissues (Biology); Biodynamics; Cancer

20020027264 Cold Spring Harbor Lab., Biological Lab., New York, NY USA
Identification and Characterization of Novel Nematode Cell Death Genes and Their Mammalian Homologs ***Final Report, 1 Jul. 1997-1 Jul 2000***
Hengartner, Michael O.; Aug. 2000; 51p; In English
Contract(s)/Grant(s): DAMD17-97-1-7177
Report No.(s): AD-A398562; No Copyright; Avail: Defense Technical Information Center (DTIC)

Apoptosis is a major determinant in the ability of cells to become cancerous. The aim of this grant was to identify conserved regulators of apoptosis using the nematode C. elegans as a model system. Specifically, we searched for proteins that interact with CED-9, the nematode homolog of the oncoprotein Bcl-2. We found that CED-9 interacts with CED-4, the worm homolog of the apoptotic regulator Apaf- 1, and characterised the regulation of CED-9 by EGL-1, a BH3 domain protein that also directly binds to CED-9. Finally, we identified a dozen additional C. elegans proteins that interacted with both CED-9 and Bcl-2 in a yeast two-hybrid system. Unfortunately, none of these proteins showed any significant effect on nematode apoptosis, either when overexpressed or inactivated by RNA interference.
DTIC
Mammals; Genetics; Cancer; Death; Apoptosis; Ribonucleic Acids

20020027266 North Carolina Univ., Chapel Hill, NC USA

Characterization of p120ctn, an Adherens Junction Protein With a Potential Role in Tumorigenesis and Cancer Metastasis ***Annual Report, 1 Jul. 2000-30 Jun. 2001***

Polevoy, Gordon; Peiffer, Mark; Jul. 2001; 13p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-98-1-8220

Report No.(s): AD-A398616; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One of the deadliest and least understood aspects of cancer is metastasis. Before a tumor can metastasize, individual cells must acquire mutations which down-regulate adhesion to neighboring cells. Down-regulating components of the adherens junctions causes increased invasiveness and metastatic potential of tumors. Adherens junctions form around cadherins that interact homo-typically to cadherins on neighboring cells. The cytoplasmic domain of cadherins interacts with a set of accessory proteins called catenins, which anchor cadherins to the acting cytoskeleton. pl20ctn, which was discovered in vertebrates, seems to be playing a regulatory rather than a structural role in adherens junctions. Before we can understand the role pl20ctn is playing in cancer, we must understand its normal cellular function. We have been studying pl20ctn in the fruitfly, Drosophila melanogaster. The objective of this research project is to characterize the role of pl20ctn by generating flies mutant for the p120 gene and characterizing them phenotypically and biochemically. We have generated 200 mutations in the pl20ctn region, and have identified a small chromosomal deletion that removes pl20ctn and affects only two complementation groups. We are testing these to determine whether either is the pl2Octn gene. We are also_characterizing anti-pl20ctn antisera.

DTIC

Metastasis; Genes; Cancer; Mutations

20020027271 Texas Univ., M. D. Anderson Cancer Center, Houston, TX USA

Dual-Energy Digital Mammography with a Full-Field aSi/CsI Flat-Panel Imager ***Annual Report, 1 Sep. 2000-31 Aug. 2001***

Shaw, Chris C.; Sep. 2001; 320p; In English

Contract(s)/Grant(s): DAMD17-00-1-0316

Report No.(s): AD-A398627; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The large goals of this project are to develop and investigate dual-energy subtraction imaging technique for use with an amorphous silicon/cesium iodide based flat panel digital mammography system. With this technique, cluttered tissue structures can be cancelled out to enhance the detection and visualization of microcalcifications. In the first year, we have performed necessary theoretical and numerical studies to investigate the calcification signal-to-noise ratio in the subtraction image as a function of x-ray spectrum combination, exposure distribution, scintillator material, calcification thickness, breast thickness and tissue composition. We have demonstrated with numerical computations that with 1000 mR un-attenuated total exposure at detector, the proposed dual-energy technique can be used to image and detect calcifications as small as 250 microns. We have also shown that 25 kvp Mo/Mo and 50 kvp W/La x-rays would provide optimal spectrum combination for best calcification SNR in the subtraction image. to prepare for actual implementation and further investigation, we have also measured, modeled and validated image signal as a function of x-ray technique, breast thickness and breast composition. Current mean glandular dose calculation has been extended to high kvp applications.

DTIC

Cancer; Mammary Glands; Amorphous Silicon; Imaging Techniques; Cesium Iodides; Silicon Compounds

20020027544 Toronto General Hospital, Toronto, Ontario Canada

Novel Radiopharmaceuticals for Radioguided Surgery of Ductal Carcinoma In Situ of the Breast ***Annual Report, 1 Sep. 2000-1 Sep 2001***

Reilly, Raymond; Oct. 2001; 17p; In English

Contract(s)/Grant(s): DAMD17-00-1-0595

Report No.(s): AD-A398240; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ductal carcinoma in situ (DCIS) is an early stage of breast cancer in which cancer cells remain confined by the basement membrane of the ducts. DCIS is treated by surgery combined with local radiotherapy. The surgeon has difficulty however in accurately defining the disease margins which may lead to re-excision or recurrent DCIS which can in some cases advance to invasive breast cancer. Our objective is to develop novel radiopharmaceuticals for radioguided surgery (RGS) of DCIS to improve the surgical management.

DTIC

Cancer; Mammary Glands; Surgery

20020027545 Pittsburgh Univ., Pittsburgh, PA USA

Remote Patient Management in a Mammographic Screening Environment in Underserved Areas ***Annual Report, 1 Sep. 2000-31 Aug. 2001***

Gur, David; Sep. 2001; 70p; In English

Contract(s)/Grant(s): DAMD17-00-1-0410

Report No.(s): AD-A398234; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Early detection of breast cancer is of significant interest to our society. Mammographic screening is gradually moving toward a distributed acquisition centralized review approach. Unfortunately, a relatively high recall rate using this approach increases patient anxiety as well as the cost and complexity of the diagnostic process. The purpose of this project is to evaluate the possible impact of a unique telemammography system that utilizes common carriers with wavelet-based data compression for image transmission, on recall rate in remote locations where physicians are not available during mammographic procedures. The initial phase of the project will encompass the design, assembly, and technical testing of a multi-site telemammography system that enables the digitization, transmission, and display of wavelet compressed images as well as associated text documents of a case in approximately 15 minutes. The impact of such a system with and without the incorporation of CAD (Computer Aided Diagnosis) results will be evaluated in a multi-site study at a later stage.

DTIC

Cancer; Medical Electronics; Computer Techniques; Mammary Glands; Telemedicine

20020027682 Wisconsin Univ., Madison, WI USA

Mapping Genetic Modifiers of Mammary Tumor Susceptibility ***Annual Report, 1 Jul. 2000-1 Jul 2001***

Williams, Rebecca L.; Moser, Amy; Aug. 2001; 22p; In English

Contract(s)/Grant(s): DAMD17-99-1-9454

Report No.(s): AD-A398591; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mutations in APC/Apc predispose both humans and mice to multiple polyps of the colon and small intestine. Min/+ mice carry a mutation at Apc and are predisposed to developing spontaneous intestinal and mammary tumors. On a C57BL/ 6J (B6) background, Min/+ mice develop spontaneous mammary tumors at a 5% rate. When injected with ENU (ethylnitrosourea), over 80% of B6 Min/+ female mice develop mammary tumors. l29/SvJ x B6 F1 mice that carry the Min mutation are resistant to mammary tumor development after ENU treatment. We produced backcross mice in order to map the modifier loci causing resistance in the (l29/ SvJ x B6) mice. Preliminary analysis of SSLP markers spaced every 20-25 cM throughout the genome indicates the possibility of two regions that contain modifiers. One region maps to chromosome 6 near the marker D6Mit36. A congenic line, ROSA26, carrying this region on chromosome 6 from 129 on a E6 background had already been established. ROSA26 mice have a LacZ insertion flanked by 129 DNA in the modifier region on chromosome 6. ROSA26 x B6 Fl Min/+ mice are resistant to mammary tumors following ENU treatment. The ROSA26 mice will be used to study the biological effects of the potential modifier.

DTIC

Cancer; Mammary Glands; Genetics; Biological Effects; Intestines

20020027684 Scripps Research Inst., La Jolla, CA USA

(ALPHA) 2 (BETA) 1 Integrin-Induced Breast Cancer Differentiation ***Annual Report, 1 Aug. 1997-31 Jul. 2001***

Kamata, Tetsuji; Aug. 2001; 29p; In English

Contract(s)/Grant(s): DAMD117-97-1-7105

Report No.(s): AD-A398563; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cell adhesive events play essential roles in the pathophysiology of breast cancer. Two important biological phenomena have been shown to depend upon integrins. The differentiation of breast cancer cells depends upon the expression of alpha2beta1 integrin on the cell surface. The creation of distant metastasis is supported by the association of breast cancer cells with platelets. This association depends on the interaction between the activated alpha2beta3 integrin on the breast cancer cell surface with the activated ALPHAIIbbeta3 integrin on the platelet surface. Thus, it is reasonable to assume that modulation of the function of those integrins may lead to the differentiation of poorly-differentiated breast cancer or the prevention of distant metastasis to other organs. to attain this goal, it is imperative to understand the precise mechanisms of integrin-ligand interaction. In this project I identified the ligand contact surfaces of alpha2beta1 and alphaIIbbeta3 integrins. The ligand contact site in alpha2beta1 is composed of several discontinuous amino acid residues surrounding the MIDAS in the alpha2beta1 domain. The alphaIIbbeta3

ligand binding interface is located on the outer edge and side of the propeller centering on beta-sheet 3 of the alphaIIb beta-propeller domain. These findings may form the basis for developing therapeutics for breast cancer.
DTIC
Ligands; Organs; Cancer; Platelets; Mammary Glands

20020027685 Medicine and Dentistry Univ. of New Jersey, Piscataway, NJ USA
A Mouse Model for Prostate Cancer ***Annual Report, 15 Jun. 2000-14 Jun 2001***
Abate-Shen, Cory; Jul. 2001; 26p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0091
Report No.(s): AD-A398566; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mouse models of carcinogenesis have provided significant insights into the molecular mechanisms of tumor suppressor gene function. Our goal is to develop mouse models that recapitulate early stages of prostate carcinoma. Using such models we have demonstrated that the Nkx3.1 homeobox gene represents a prostate-specific tumor suppressor that undergoes epigenetic inactivation through loss of protein expression. Loss-of-function of Nkx3.1 in mice results in histopathological defects that resembles prostate cancer initiation in humans, and cooperates with loss-of-function of the Pten tumor suppressor gene in cancer progression. Furthermore, our findings suggest that the molecular mechanisms that mediate this cooperativity include the synergistic activation of Akt (protein kinase B), a key modulator of cell growth and survival. We propose that interactions between tissue-specific regulators such as Nkx3.1 and broad-spectrum tumor suppressors such as Pten underlie the distinct phenotypes of different cancers.
DTIC
Mice; Prostate Gland; Enzyme Activity; Carcinogens

20020027686 Georgetown Univ., Medical Center, Washington, DC USA
Targeting of Prostate Cancer with Hyaluronan-Binding Proteins ***Annual Report, 1 Jun. 2000-31 May 2001***
Zhang, Lurong; Jun. 2001; 32p; In English
Contract(s)/Grant(s): DAMD17-00-1-0081
Report No.(s): AD-A398567; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This study is to test if hyaluronan (HA) binding proteins (HABP), an abundant protein in cartilage, is a new category of anti-tumor substance. This hypothesis is based on the facts that: (1) the shake cartilage powder or its extracts have been widely used by patients with different tumors in USA, Europe and Asia for a decade, in believing that avascular cartilage might contain some natural anti-tumor/angiogenesis substance; (2) certain angiogenic inhibitor, such as endostatin, has HA binding domain; and (3) some hyaluronan binding proteins, such as soluble CD44 and proteins from scapular chondrocytes or have anti-tumor/angiogenesis effect. In the past year, we have purified a large quantity of hyaluronan binding proteins from bovine cartilage and test its anti-tumor and anti-angiogenesis effects. The result are promising, indicating that (1) HABP can inhibit the anchorage- dependent and independent growth of tumor cells; (2) HABP can inhibit proliferation and migration of endothelial cells in vitro and angiogenesis in vivo; (3) HABP can reduce the growth of TSU prostate cancer and other tumor in vivo; (4) HABP can inhibit the experimental lung metastasis. It seems that HABP is a good candidate for development into a new anti- tumor agent. Next year, we will focus on test HABP from human source using molecular biology approaches. The human HABP will be cloned, inserted into expression vector and transfected into prostate cancer cells or infected in established prostate tumor to see the effect of human HABP on tumor growth. The underlying molecular mechanism of HABP by which it exerts anti-tumor/ angiogenesis effect will also be explored.
DTIC
Proteins; Prostate Gland; Cartilage

20020027689 Illinois Univ., Broad of Trustees, Chicago, IL USA
Identification of Novel Inhibitory Peptides of Protein-Protein Interactions Involved in DNA Repair as Potential Drugs in Breast Cancer Treatment ***Final Report, 1 Sep. 2000-31 Aug. 2001***
Beck, William T.; Sep. 2001; 12p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0624
Report No.(s): AD-A398548; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Protein-protein interactions are critical to almost every cellular process. Disruption of these interactions would effectively interfere with the cell's functions and its ability to grow and divide normally. The Rad51 and Rad52 proteins are important proteins involved in DNA repair. Rad51 acts as a hexamer binding single-stranded DNA to drive strand exchange during homologous recombination. by blocking Rad51 from multimerization we can theoretically disrupt homologous recombination, and thus

decrease the efficacy of DNA repair. Deficiency in DNA damage repair will sensitize cells to DNA damaging agents and thus such tumors can be effectively treated with a lower dose of chemotherapeutic agents/radiation. Short peptides of a few amino acids (5-10) have been shown to be enough to destabilize protein-protein interactions. Thus a library of random combinatorial peptides of sufficient complexity will in theory have an inhibitory molecule for any protein-protein interaction. This project attempts to isolate peptides that inhibit Rad 51 from multimerisation to be used as a chemosensitizing agent during chemo/radiotherapy using a modified Yeast two hybrid screen called the reverse two-hybrid system.
DTIC
Proteins; Peptides; Deoxyribonucleic Acid; Cancer; Destabilization; Combinatorial Analysis

20020027691 Texas Univ., M D Anderson Cancer Center, Houston, TX USA
Molecular Engineering to Retarget Human Cytokines ***Annual Report, 1 Jul. 2000-30 Jun. 2001***
Rosenblum, Michael G.; Jul. 2001; 40p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9259
Report No.(s): AD-A398551; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Overexpression of the HER2/neu oncogene in breast cancer cells blocks the biological activity of the cytokine TNF and allows these cells to escape immune surveillance mechanisms. We have developed a fusion construct composed of a single-chain antibody recognizing HER2/neu and TNF. Against cells over-expressing HER2/neu and resistant to TNF, this scfv23/TNF fusion construct was shown to have impressive cytotoxic properties (I.C.50 = 35-50 nM) . Signal transduction studies indicate that the cytotoxic effects of the scfv23/TNF construct are not mediated by changes in TNFR-1, TRADD, TRAF2, NfkB, AKT, or caspase 3 or 7. In contrast, we found activation of caspase 8 and 6 to be the primary pathway for activation of apoptosis by scfv23/TNF. We also found that treatment of SKBR3 cells with scfv23/TNF resulted in inhibition of MMP-9. This is in contrast to treatment of cells with TNF, which results in activation of MMP-9. In preparation for animal model studies, we have also developed a bacterial expression system for generation of the requisite large amounts of protein needed for the planned in vivo studies.
DTIC
Neoplasms; Chromatography; Necrosis; Toxins and Antitoxins; Activity (Biology)

20020027692 Creare, Inc., Hanover, NH USA
MR Elastography System for Breast Cancer Detection ***Annual Report, 30 Sep. 2000-30 Sep 2001***
Kline-Schoder, Robert J.; Kenton, Marc A.; Oct. 2001; 23p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0677
Report No.(s): AD-A398553; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Early diagnosis of breast cancer, which is critical for favorable clinical outcomes, is difficult because of the need to detect small tumors. One physical property that clearly distinguishes healthy from cancerous tissue is mechanical stiffness or hardness. Researchers have attempted to combine external mechanical stimulation and Magnetic Resonance Imaging (MRI) to quantitatively measure the Young's modulus of tissue throughout both the breast and the prostate. This technique, Magnetic Resonance Elastography (MRE) has been called "palpation at a distance." One of the most challenging technical aspects of MRE is the solution of the "inverse problem," i.e., quantitatively determining Young's modulus from MRI-measured tissue displacement data. Creare is developing analytical solution techniques to improve the efficiency and robustness of the inverse problem solution. One technique, which combines an adjoint method for calculating the gradient of the goodness-of-fit metric combined with a quasi-Newton algorithm, appears to provide a substantial improvement in efficiency. We are also investigating improvements in the physical modeling on which the inverse method is based, primarily in the representation of tissue compressibility.
DTIC
Magnetic Resonance; Cancer; Goodness of Fit; Imaging Techniques; Algorithms

20020027693 Uniformed Services Univ. of the Health Sciences, F Edward Hebert School of Medicine, Bethesda, MD USA
Job Stress Reactivity and Work-Related Musculoskeletal Symptoms
Storey, Julie; Sep. 07, 2001; 218p; In English
Report No.(s): AD-A398554; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Research regarding risk factors and correlates of work-related upper extremity (WRUE) symptoms and disorders have identified important ergonomic, workplace pychosocial, and individual psychosocial factors in their etiology, exacerbation and maintenance. Elevated levels of job stress have been frequently reported in this population, and epidemiological studies indicate job stress is associated with symptom severity, functional limitations, and lost work time in individuals with a variety of work-related upper extremity disorders. Although plausible pathophysiologic mechanisms exist linking the stress response to

WRUE symptoms, little is known about the specific effects of stress on potential musculoskeletal and sympathetic nervous system mediators and how they may impact WRUE symptoms. Additionally, it is unclear if workers with these difficulties respond differently to stressors than asymptomatic workers. The present study was an exploratory investigation designed to address four primary questions: (1) do individuals with WRUE symptoms report higher levels of job stress and ergonomic exposure than asymptomatic individuals, (2) do workers with WRUE symptoms respond with greater musculoskeletal, neuroendocrine, and psychological responses than asymptomatic workers, (3) can ergonomic, psychosocial and physiological variables significantly discriminate between symptomatic and asymptomatic workers, and, (4) if they can discriminate between the groups, are the discriminating factors associated with general and WRUE-specific clinical outcomes. Results suggest that important ergonomic, psychosocial and physiological differences exist between these groups, including potential tonic heart rate elevations, tonic forearm musculature hyperarousal, and a tendency to experience prolonged cognitive and behavioral consequences to stressful events.
DTIC
Work; Musculoskeletal System; Signs and Symptoms; Endocrine Systems

20020027837 University of South Florida, Tampa, FL USA
Weight Gain in Breast Cancer Patients on Chemotherapy: Exploring Hormonal, Body Composition and Behavior Mechanisms ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Kumar, Nagi B.; Sep. 2001; 19p; In English
Contract(s)/Grant(s): DAMD17-98-1-8240
Report No.(s): AD-A398659; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The purpose of the study is to observe the relative contribution of thyroid function, sex-hormonal levels, physical activity, psychological state, and nutritional intake on changes in body weight in a group of breast cancer patients, receiving adjuvant chemotherapy. Based on the preliminary observations, weight gain in breast cancer patients may be a phenomenon resulting from hormonal and lifestyle changes and offers an opportunity for prevention and improved prognosis.
DTIC
Body Weight; Cancer; Mammary Glands; Thyroid Gland; Nutrition

20020027889 Duke Univ., Medical Center, Durham, NC USA
The Mechanism of E2F/p130 Mediated Repression and its Potential Tumor Suppressor Function in Breast Cancer ***Annual Report, 1 Jul. 1998-30 Jun. 2001***
Meloni, Alison R.; Nevins, Joseph; Jul. 2001; 56p; In English
Contract(s)/Grant(s): DAMD17-98-1-8074
Report No.(s): AD-A398244; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Transcriptional repression in quiescent cells is critical for the maintenance of cellular growth control. Previous work has shown the importance of E2F/Rb and E2F/pl30 complexes in mediating repression of genes that are involved in cell cycle progression, however, the mechanisms of action of these complexes remains unclear. The purpose of the work supported by this grant is to identify the mechanisms of pl30 mediated transcriptional repression. to this end we have established that pl30 recruits histone deacetylase as one mechanism of repression. Through a yeast two-hybrid screen, we have also found that the CtIP protein can interact with pl30 and mediate a histone deacetylase independent mechanism of transcriptional repression. This mechanism involves the recruitment of the CtBP protein, which we have found to be capable of inhibiting the CBP transcriptional coactivator. These findings are significant not only to cancers related to deregulated 52K activity but also to breast cancers involving mutations of BRCA1 (Breast Cancer Susceptibility Gene 1)as the BRCA1 protein has been shown to interact functionally with CtIP.
DTIC
Cancer; Mammary Glands

20020027890 Michigan Univ., Ann Arbor, MI USA
Interleukin-6 and Prostate Cancer Progression ***Annual Report, 1 Jul. 2000-30 Jun. 2001***
Keller, Evan T.; Jul. 2001; 30p; In English
Contract(s)/Grant(s): DAMD17-00-1-0530
Report No.(s): AD-A398242; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
In the current work we are exploring the hypothesis that interleukin-6 (IL-6) contributes to the progression of prostate cancer (PCA) through enhancing AR (Androgen Receptor) activity. Objective I is to determine the mechanism through which IL-6 sensitizes AR to androgen. We have determined that IL-6 induces AR expression through stimulation of the AR gene promoter. Furthermore, IL-6 enhances AR activity in the absence of androgen. Objective II is to evaluate if inhibition of IL-6 diminishes

PCA proliferation in a rodent model. We have determined that administration of anti-IL-6 antibody induces regression of established PC-3 PCA cell line tumors in a murine xenograft model through induction of apoptosis.
DTIC
Cancer; Prostate Gland

20020027892 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA
Effect of Isokinetic Strength Training and Deconditioning on Bone Stiffness, Bone Density and Bone Turnover in Military-Aged Women ***Annual Report, 1 Jun. 2000-31 May 2001***
Herbert, William; Jun. 2001; 48p; In English
Contract(s)/Grant(s): DAMD17-00-1-0114
Report No.(s): AD-A398256; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

For physically active military personnel, stress fractures are debilitating and costly. Female soldiers sustain twice the number of stress fractures compared to males. Exercise interventions for women are needed to promote military readiness in ways that enhance bone strength and reduce stress fractures. This study, currently in progress, is investigating the effects of 30 weeks of concentric Vs eccentric isokinetic resistance training on bone stiffness (mechanical impedance), quality (mineral density and content), and bone cell activity (biomarkers of turnover). Female volunteers (N = 120), 18-26 years of age are categorized into normal bone density (NBD, n = 60) and low bone density (LBD, n = 60) subgroups, based on whole body bone density measurements. Subjects then are randomly assigned within NBD and LBD subgroups for concentric (n = 30 LBD, a = 30 NBD) and eccentric (n = 30 LBD, n = 30 NBD) exercise training. Exercises are performed using non-dominant arms and legs, leaving dominant limbs as self-controls. Results of this study will enhance understandings of effects of specialized exercise training on bone adaptations among young adult females. This work has important implications for reducing stress fractures arising from combat-readiness activities and for preventing osteoporosis in women.
DTIC
Physical Fitness; Females; Bones; Density Measurement; Armed Forces

20020027893 Tripler Army Medical Center, Honolulu, HI USA
Vasopressin Regulation and Renal Fluid and Electrolyte Handling in Rat Models of Acute and Chronic Alcohol Exposure ***Annual Report, 1 Oct. 2000-30 Sep. 2001***
Uyehara, Catherine F.; Oct. 2001; 15p; In English
Contract(s)/Grant(s): DAMD17-00-1-0673
Report No.(s): AD-A398255; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Despite evidence of impaired renal fluid handling, hyponatremia, and water retention in chronic alcohol exposure and during withdrawal, the renal mechanisms involved and the role of altered vasopressin action in the kidney have not been elucidated. We have shown that the efficacy of endogenous vasopressin on the kidney and resultant changes in renal water excretion is differentially altered in the different phases of alcohol exposure. Rats acutely exposed to alcohol exhibit an increased water diuresis in response to a water load whereas rats chronically exposed to alcohol exhibit an impaired ability to excrete a water load. We have further demonstrated that this impaired ability to excrete a water load in chronic alcohol exposure occurs under conditions of an increased renal sensitivity to vasopressin as demonstrated by suppressed diuretic efficacy of a V2 antagonist. Thus, our results to date have provided evidence of water imbalance with alcohol exposure that is likely due to altered function or numbers of vasopressin receptors, specifically renal V2 receptors, involved with tubular water reabsorption. Additionally, preliminary examination of the relationship between vasopressin pituitary and blood content indicates there is an uncoupling of the regulation of vasopressin release and circulating levels with alcohol exposure.
DTIC
Beverages; Kidney Diseases; Pituitary Hormones; Alcohols

20020027894 Rush-Presbyterian-Saint Luke's Medical Center, Chicago, IL USA
Gene Therapy in a Nonhuman Primate Model of Parkinson's Disease ***Annual Report, 15 Sep. 2000-14 Sep 2001***
Kordower, Jeffrey H.; Oct. 2001; 8p; In English
Contract(s)/Grant(s): DAMD17-98-1-8630
Report No.(s): AD-A398254; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In the third year of this grant, we are about to complete one experiment, and have initiated another. In Experiment 1, we assessed whether lentiviral delivery of the antiapoptotic gene Bcl-2 could prevent the functional and structural consequences of MPTP (1-methyl-4-phenyl-tetrahydropyridine) toxicity in nonhuman primates. Our preliminary data indicate that lentiviral delivery of Bcl2 did not influence MPTP-mediated motor deficits as measured on a clinical rating scale and an operant hand reach

task, likely because Bcl-2 may not be able to preserve striatal dopaminergic innervation. We are currently evaluating Neurochemically and morphologically whether lenti- Bcl2 provided neuroprotection at the level of the substantia nigra. We have just initiated a second experiment in which aged monkeys are assessed for levodopa-induced dyskinesias and given a fluorodopa PET (positron emission tomography) scan. They then receive lenti-GDNF (glial derived neurotrophic factor) under the control of the tetracycline promoter. Three months following lenti-GDNF, they are again assessed for levodopa-induced dyskinesias and given a fluorodopa PET scan. Then half of the aged monkeys receive tetracycline to shut of the GDNF expression in vivo. Monkeys are assessed for levodopa-induced dyskinesias and given a fluorodopa PET scan three and six months later. This study will determine whether we can control gene expression in vivo and make gene therapy safe for clinical use.
DTIC
Parkinson Disease; Neurophysiology

20020028157 Georgetown Univ., Medical Center, Washington, DC USA
C-7 Progesterone Analogues and MDR1 in Breast Cancer ***Final Report, 1 Sep. 1996-31 Aug. 2001***
Clarke, Robert R.; Sep. 2001; 151p; In English
Contract(s)/Grant(s): DAMD17-96-1-6231
Report No.(s): AD-A398655; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche
We have generated novel analogs of progesterone (PgA) as potent inhibitors of the MDR1 multidrug resistant phenotype in breast cancer. The objectives of this research project include the optimization of the PgA's MDR1-reversing activity through the generation of additional compounds, using an analog design approach, the definition of these compounds' in vivo efficacy, and of their mechanism of action. In the course of the fourth year of the project, we have: (1) tested the in vivo MDR-reversing activity of PgA4, the most potent among our initial progesterone analogs; (2) designed and synthesized additional progesterone analogs and evaluated their structure-activity relationships; (3) related the in vitro activity of some of the analogs to their in vitro toxicity.
DTIC
Cancer; Hormones; Inhibitors; Mammary Glands

20020028168 Catholic Univ. of America, Washington, DC USA
A Computer-Based Decision Support System for Breast Cancer Diagnosis ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Wang, Zuyi; Sep. 2001; 31p; In English
Contract(s)/Grant(s): DAMD17-98-1-8044
Report No.(s): AD-A398377; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The goal of this project is to develop decision support system for breast cancer diagnosis, treatment option, prognosis, and risk prediction. This project focuses on the development of advanced image pattern analysis in diagnostic imaging and information integration methodology to statistically analyze the distinction between lesion-like normal site and real lesion site. The specific aims of this research project are: (1) image pattern analysis of breast tissue in mammography using both computational features and BI-RADS features provided by radiologist for the prediction of malignancy associated with masses; (2) development of visual presentation methods for radiologists' use in the consultation system; (3) performing a pre-clinical test through an ROC analysis. The clinical goal of this consultation system is to provide scientific tools for doctors to have electronic magnification views, to perform feature analysis of suspected mammographic patterns, to access a large database and investigate clinically similar cases, and to visually inspect the features of a case in various statistical distribution using graphic displays. We have accomplished (1) feature extraction, (2) feature database construction, (3) data mining visual explanation tool development, (4) feature database structure exploration, (5) feature ranking and selection, and (6) classification of mass and non-mass.
DTIC
Medical Electronics; Cancer; Mammary Glands; Computer Techniques

20020028169 Boston Univ., Boston, MA USA
A Re-Examination of Neuropsychological Functioning in Persian Gulf War Era Veterans ***Annual Report, 24 Jan. 2000-23 Jan 2001***
White, Roberta F.; Feb. 2001; 42p; In English
Contract(s)/Grant(s): DAMD17-00-1-0063
Report No.(s): AD-A398378; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Existing data from our group suggest that Gulf War (GW) veterans score worse on a specific group of neuropsychological tests than GW-era veterans not deployed to the Gulf. These findings raise the possibility of subtle, subclinical central nervous system (CNS) damage associated with Gulf deployment. A critical question is whether these findings may be attributable to exposure to neurotoxicants in the Gulf environment. Recently some PGW veterans have reported that their cognitive functioning

has been worsening over time since their return from the Gulf. This report is at odds with the usual course of CNS effects of intoxication, which generally remit or remain static in the absence of exposure. The reports of declining cognition raise the issue of exposure to toxicants that might produce a progressive condition versus the existence of other conditions that might affect cognition in individuals who are experiencing progressive functional declines. The specific aims of the project are: 1) to determine whether objective test measures reveal progressive diminution in cognitive function by comparing test performance observed initially (1995-1998) to performance four years (+/- 6 months) later and 2) to identify the factors associated with any cognitive diminutions including chemical exposures, stress, or psychiatric disorders.
DTIC
Physiological Effects; Neurology; Mental Performance; Persian Gulf; Neurophysiology

20020028170 Colorado Univ., Health Sciences Center, Denver, CO USA
Chemotherapy of Late Stage Breast Cancer Targeted Towards Cell Cycle Regulatory Components ***Annual Report, 15 Sep. 2000-14 Sep 2001***
Sclafani, Robert A.; Oct. 2001; 42p; In English
Contract(s)/Grant(s): DAMD17-98-1-8299
Report No.(s): AD-A398382; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Two drugs have been studied as potential therapeutic agents for late stage breast cancer patients. 5-aza-2-deoxycytidine (5-Aza-CdR), is an inhibitor of DNA methylation and is targeted for re-expression of a repressed tumor suppressor gene known as p16. Re-activation of the p16 gene in cells in which the gene is methylated will restore normal growth control and be efficacious in treatment of breast cancer patients. Both p16 protein expression and de-methylation of the p16 promoter occurs in breast cancer cells, treated with 5-Aza-CdR. 5-Aza-CdR also destroys the ability of the cells to grow in an anchorage-dependent manner, thereby indicating that the drug can inhibit tumorigenesis. We have currently developed a better model for the action of the drug by screening a number of breast cancer cell lines for methylated p16 and then testing the efficacy of the drug in a nude mouse model. A non-invasive blood test has also been developed for the detection of p16 methylation that will allow us to easily identify patients suitable for a 5-Aza-CdR clinical trial. Clinical protocols to accomplish this goal have been approved. A phase II clinical trial with a second drug, Bryostatin-1, has been opened again, but no patients have yet been accrued.
DTIC
Chemotherapy; Methylation; Cancer; Mammary Glands

20020028171 Mayo Foundation, Rochester, MN USA
Alcohol and Adaptation to Mechanical Usage ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Turner, Russell T.; Oct. 2001; 100p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8517
Report No.(s): AD-A398383; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche
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 0l September 2000 to 31 August 2001. During Year 3 of the award we have continued analysis of experiments performed in Year 2 related to Tasks 7 and 8. Additional experiments were performed to accomplish Task 6. The new studies are directed toward determination of the effects of ethanol on: the skeletal response to unloading (Task 6), skeletal adaptation to treadmill running (Task 7), and PTH-induced increases in mRNA levels for bone matrix proteins (Task 8). The results to date strongly support our hypothesis that alcohol abuse contributes to skeletal injuries suffered during the course of rigorous physical training activities.
DTIC
Hormones; Membranes; Cells (Biology); Bones; Alcohols; Beverages; Physiological Effects

20020028172 Mayo Foundation, Rochester, MN USA
Ultrasonic Stimulated Acoustic Emission for Detection of Breast Microcalcifications ***Annual Report, 15 Apr. 2000-14 Apr 2001***
Fatemi, Mostafa; May 2001; 51p; In English
Contract(s)/Grant(s): DAMD17-98-1-8121
Report No.(s): AD-A398384; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The purpose of this research is to develop an experimental imaging system based on Ultrasound Stimulated Acoustic Emission (USAE) for detecting microcalcifications in human breast tissue specimens. The scope of this research is to improve

the laboratory USAE system and evaluate its performance on breast tissue specimens containing microcalcifications. The first task of this research is focused on system development and optimization for detection of beast microcalcifications. The second task is centered on imaging breast tissues and evaluating the performance of USAE method in detection of microcalcifications. Here we report our progress on imaging tissue samples (Task 2). Results show that USAE can detect microcalcifications in various pathological conditions. We also report recent improvements in our experimental system.
DTIC
Ultrasonics; Acoustic Emission; Cancer; Mammary Glands

20020028176 California Univ., Los Angeles, CA USA
Development of a Transgenic Stem Cell Model of Prostate Cancer ***Final Report, 1 Sep. 1998-28 Feb. 2001***
Reiter, Robert E.; Mar. 2001; 53p; In English
Contract(s)/Grant(s): DAMD17-98-1-8578
Report No.(s): AD-A398374; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The overall goal of of our proposal is to develop a new transgenic model of prostate cancer by targeting transformation to prostatic basal cells using the PSCA promoter. Major Findings: A 9kb region upstream of the PSCA (prostate stem cell antigen) coding region was isolated and demonstrated to drive prostate-specific expression in vitro. This region was subsequently tested in vivo using a GFP reporter construct. Analysis of these mice showed the GFP expression was almost exclusively localized to the prostate. GFP expression in these mice was regulated developmentally, with prominent expression localized to the ductal tips of the prostate. Promoter activity was both responsive to androgen and independent of androgen. Recently we have tried to use this promoter to target expression of oncogenes to the prostate. Multiple attempts have failed to produce founders. Analysis of PSCA and GFP expression during embryogenesis showed that PSCA is expressed in multiple epithelial tissues in utero. Conclusion: The PSCA promoter can target a subset of prostate epithelial cells in vivo, but inducible forms of the promoter may be necessary to deliver oncogenes to these cells.
DTIC
Antigens; Prostate Gland; Cancer

20020028178 Burnham Inst., La Jolla, CA USA
Phage Display Breast Carcinoma cDNA Libraries: Isolation of Clones Which Specifically Bind to Membrane Glycoproteins, Mucins, and Endothelial Cell Surface ***Final Report, 1 Jul. 2000-30 Jun. 2001***
Yamamoto, Fumichiro; Jul. 2001; 5p; In English
Contract(s)/Grant(s): DAMD17-98-1-8168
Report No.(s): AD-A398247; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
We attempted to identify phage display cDNA clones that exhibited proteins with carbohydrate affinity, using libraries constructed in mid copy display T7Select 10-3 vector. Although we hoped that higher affinity with multiple number of capsid fusions would facilitate the screening of those clones, the attempts have been unsuccessful.
DTIC
Cancer; Mammary Glands; Cloning (Biology)

20020028179 Virginia Univ., Charlottesville, VA USA
UG311, An Oncofetal Marker Lost with Prostate Cancer Progression ***Annual Report, 1 Apr. 2000-31 Mar. 2001***
Sikes, Robert A.; Apr. 2001; 79p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0049
Report No.(s): AD-A398251; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The nRNA expression of a paralogous human sequence to UG311, a murine urogenital sinus expressed sequence tag, was found to decrease with androgen independent progression in the LNCaP model of human prostate cancer progression as determined by RNA blotting. Analysis of the sequence of UG311 determined significant homology to a single-stranded nucleic acid binding protein, nmt55. To exclude nmt55 as the gene corresponding to UG311, antibodies and cDNAs were acquired. Scope: As members of the single-stranded nucleic acid binding protein family, nmt55 and UG311 may play a role in DNA repair or RNA splicing. Both functions are currently under evaluation for nmt55. Either of these functions is likely to have impact on the progression and potential therapeutic outcome for prostate cancer patients. Improper splicing would lead to entire classes of proteins being disrupted. Loss of DNA repair enzymes would lead to increased genoinic instability and accelerated progression. Major Findings/progress: As outlined in Aim 2, human prostate tissues and cell lines were screened by IHC (immunohistochemistry). RNA blot analysis was performed to compare with the expression of UG311 in the LNCaP progression model. The data indicate that nmt55 expression does not change with stage or grade nor does the expression of nmt55 mRNA

resemble the loss of expression previously observed for UC311 in the LNCaP model of prostate cancer progression. Therefore, the goals of aim 1 become more pertinent. to this end current efforts are focusing on the cloning of the UC311 paralog by RACE and phage library screening A lambda ZAP library has been constructed from C4-2 cells to screen for paralogous clones. RACE assays are underway.
DTIC
Genes; Cancer; Prostate Gland

20020028180 Virginia Commonwealth Univ., Richmond, VA USA
The Effect of Emotional Disclosure Interventions on Psychological and Physical Well-Being of Breast Cancer Patients ***Annual Report, 1 Jul. 2000-30 Jun. 2001***
Figueiredo, Melissa; Fries, Elizabeth; Jul. 2001; 7p; In English
Contract(s)/Grant(s): DAMD17-99-1-9427
Report No.(s): AD-A398253; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Breast cancer is the second leading cause of cancer death in women in the USA and thus it is important to study the psychosocial impact of treating this disease. A large body of literature supports the health benefits associated with both written and oral disclosure of emotional traumas in healthy populations. The proposed research is a controlled, randomized trial to test the effectiveness of two types of emotional disclosure interventions. One hundred fifty early stage, breast cancer patients will be randomly assigned to one of three conditions: cancer-specific disclosure, non-cancer related disclosure, or a control. During the intervention, participants will write on three occasions about either their deepest thoughts and feelings about their cancer diagnosis and treatment, their deepest thoughts and feelings about a non-cancer related traumatic event, or a superficial topic. Currently, 73 breast cancer patients are enrolled in the study. Measures of physical and emotional well-being are collected via telephone at baseline, one month, and six months following the intervention. A one year no-cost extension has been requested and approved to enroll more participants. The results from this study have important implications for psychosocial care of breast cancer patients and may inform future interventions for improving women's health.
DTIC
Patients; Emotions; Cancer; Mammary Glands

20020028381 California Univ., Los Angeles, CA USA
Gene Delivery for Metastatic Prostate Cancer Cells ***Final Report, 15 Jan. 1999-30 Sep. 2001***
Pang, Shen; Oct. 2001; 30p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9033
Report No.(s): AD-A398665; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We have constructed a diphtheria toxin A (DTA) gene expression vector driven by the PSAR-PSAR (Prostate Specific Antigen Reduction) promoter. The prostate-specific expression of the DTA gene specifically destroyed prostate cancer cell line LNCaP in vitro. Enhanced by the bystander effect, the specific expression of the DTA gene causes significant cell death in prostate cancer cell cultures, with very low background cell eradication in control cell lines. The highly specific and efficient cytopathicity of the DTA vector will potentially be valuable for systemic treatment of patients with metastatic prostate cancer. We also constructed prostate-specific lentiviral vectors and used nude mice carrying human prostate cancer cell line LNCaP as animal model (Cancer Gene Therapy, in press). Significant tumor regression has been demonstrated in mice injected by the prostate-specific DTA vector while no pathogenic effects have been demonstrated. Our results demonstrated that vectors that are constructed by combining our prostate tissue-specific promoter and the DTA gene offer target-specific prostate cancer cell eradication in both cell culture and in vivo.
DTIC
Deoxyribonucleic Acid; Genes; Medical Services; Metastasis; Prostate Gland; Cancer

20020028383 Wisconsin Univ., Madison, WI USA
ErbB2 Regulation of c-src Activity in Breast Cancer ***Final Report, 1 Jul. 1996-30 Jun. 2001***
Sheffield, Lewis G.; Jul. 2001; 27p; In English
Contract(s)/Grant(s): DAMD17-96-1-6108
Report No.(s): AD-A398670; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Overexpression of ErbB2 in mammary epithelial cells increases activity, but not expression, of c-src. This effect is not mimicked by other transforming oncogenes. These results suggest that previous results in transgenic animals are likely to be due to direct effects on mammary epithelium, not to alterations in systemic physiology (such as hormone levels) or to altered epithelial stromal interactions. Results indicate that induction of c-src activity is mediated by increased activity of a src-directed phosphatase

that removes an inhibitory phosphate at Y527. SHP2 appears to be a leading candidate for the phosphatase. In addition, the activation of c-src by ErbB2 appears to play a critical role in inducing a tumor phenotype. These results that strategies to modify src activity or the activity of the src-directed phosphatase(s) may prove useful in modifying tumor progression.
DTIC
Proteins; Phosphorylation; Cancer; Mammary Glands

20020028384 California Univ., Riverside, CA USA
Stimulation of p53-Dependent Transcription by the Growth Suppressor, c-Abl ***Final Report, 1 Jul. 1996-31 May 2001***
Liu, Xuan; Cogan, John; Jul. 2001; 17p; In English
Contract(s)/Grant(s): DAMD17-96-1-6079
Report No.(s): AD-A398668; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Although it is known that c-Abl stimulates p53-dependent transcription, a function required for c-Abl growth suppressor activity, the molecular mechanism by which this occurs remains elusive. The results obtained with this grant award show that c-Abl interacts with the C-terminal regulatory domain of tetrameric form of p53 and functions to activate the p53 DNA-binding. In an effort to assess the mechanism of c-Abl activation, we also show that c-Abl activates p53 DNA-binding by stabilizing the p33-DNA complex. Collectively, these results suggest a model for c-Abl activation. In this model c-Abl activates latent p53 by relieving the C-terminal inhibitory domain of p53 and enhances p53 DNA-binding by forming a stable p53-DNA complex.
DTIC
Cells (Biology); Growth; Cancer; Genetics; Mammary Glands

20020028385 Kaiser Foundation Research Inst., Oakland, CA USA
Validation of Causal Analysis for Obtaining Intervention-Study Results from Non-Intervention Studies ***Final Report, 25 Sep. 2000-24 Sep 2001***
Aickin, Mikel G.; Oct. 2001; 16p; In English
Contract(s)/Grant(s): DAMD17-00-1-0613
Report No.(s): AD-A398676; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Recent research on breast cancer etiology has two important characteristics. (1) Most studies focus on a single potential causal agent, and (2) a large number of such agents have been studied, mostly retrospectively. This project performed a literature search in order to categorize recent studies with respect to their inferential structure, and risk factors investigated. Based on this review, this project developed new methods in time-to-event analysis that support a simulation/causation approach to the study of breast cancer. A new method of representing time-to-events was developed. It shows that the Kaplan-Meier method is appropriate for the simulation/causation approach, but that it cannot be used in retrospective studies. The bias was computed explicitly, and a new complementary exponential method for unbiased estimation of incidence rates in retrospective studies was developed. Although the methods of modern causal analysis can be extended to retrospective studies, their atemporal nature makes them less useful from a simulation/causation perspective.
DTIC
Cancer; Mammary Glands; Etiology

20020028387 American Registry of Pathology, Rockville, MD USA
Concurrent and Independent Genetic Alterations in Epithelial and Stromal Components of Breast Neoplasms: Implication for Tumor Development and Progression ***Final Report, 30 Sep. 2000-30 Sep 2001***
Tavassoli, Fatteneh A.; Man, Yan-gao; Oct. 2001; 32p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0676
Report No.(s): AD-A398673; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Our previous study on paraffin embedded tissues from patients with mammary carcinomas revealed a high frequency of loss of heterozygosity (LOH) in microdissected epithelial (EP) and adjacent or distant stromal (ST) cells. This study attempts to confirm previous findings on a larger scale and in a wider spectrum. Immunohistochemical and genetic analyses were performed on malignant and benign EP lesions with and without distinct ST alterations. Our findings show that morphologically comparable ST cells associated with malignant and benign lesions display substantially different immunostaining patterns with antibodies to cell proliferation associated proteins, blood vessel components, and extracellular matrix molecules, and also show different frequencies and patterns of LOH at multiple chromosomal loci. ST cells from neither malignant nor benign lesions, however, display LOH or microsatellite instability with multiple DNA markers at chromosome l7p. These results are consistent with those of our previous studies, suggesting that 1) morphologically comparable ST cells in malignant and benign lesions are

biofunctionally and genetically different and their genetic alterations correlate with those in their EP counterparts; 2) the biofunctions of ST cells may be independent of p53 gene regulation.
DTIC
Epithelium; Neoplasms; Genetics; Cancer; Mammary Glands

20020028389 Northern California Cancer Center, Union City, CA USA
Breast Cancer Outreach for Underserved Women: A Randomized Trial and Cost-Effectiveness Analysis ***Final Report, 1 Jun. 1996-31 May 2001***
Pasick, Rena J.; Jun. 2001; 41p; In English
Contract(s)/Grant(s): DAMD17-96-1-6070
Report No.(s): AD-A398684; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

BACCIS-II, is a randomized controlled trial of an outreach intervention designed to increase the rate of periodic mammography among underserved women. The purpose was to assess the feasibility and cost-effectiveness of BACCIS-II, a moderate level of intervention, compared retrospectively with the more intensive predecessor, BACCIS, and compared with a minimal (control group) intervention. In BACCIS-II, women in low-income communities are encouraged to become 'links' to the community to identify women ages 45+ with no mammogram past two years, and to provide their names to project staff. Women were then called by part-time staff who offered education, motivation and assistance in obtaining screening. Only 346 women were recruited by links, a number far short of our goal indicating low feasibility of the model. Outcome data are available for 60% of the sample who could be recontacted 14-25 months after recruitment for a telephone survey. A significantly higher proportion of women in the intervention group received a mammogram since baseline (83% vs 67%, p = 0.02) despite the fact that women in the intervention group reported significantly lower income (p is less than .05) and had less health insurance (p is less than 0.0001). We conclude that outreach to underserved women remains time-consuming and costly. However, personal contact by trusted others is effective in motivating and assisting women to obtain initial and repeat screening.
DTIC
Cost Effectiveness; Cancer; Mammary Glands

20020028390 Catholic Univ. of America, Washington, DC USA
Improving Clinical Diagnosis Through Change Detection in Mammography ***Annual Report***
Wang, Yue J.; Sep. 2001; 67p; In English
Contract(s)/Grant(s): DAMD17-98-1-8045
Report No.(s): AD-A398681; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Temporal change of mass lesions overtime is a key piece of information in computer-aided diagnosis of breast cancer and treatment monitoring. For a specific patient, change detection is a critical step to select lesion candidates for follow-up diagnosis performed by either clinicians or computers. In the third year of this project, we developed a hybrid image registration technique to align temporal sequences of the same patient and detect changing lesions, and developed a neural network based classifier to derive the probabilities of true masses. In particular, we developed: (1) mPAR and MLP-based registration algorithm to recover non-rigid deformation; (2) a new change detection scheme using independent component analysis of image sequences; (3) a feature extraction algorithm to obtain discriminative imagery features of true masses against mass-like normal tissues; and (4) a neural network based decision support system for mass detection. Our preliminary studies have shown a very good performance of the mass detection system consisting of 91 mammograms. The performance was initially 0.78-0.80 for the areas A(sub z) under the ROC (receiver operating characteristic) curves using the conventional neural network, and later being improved to A(sub z) values of 0.84-0.89 when using the newly developed multiple circular path neural networks.
DTIC
Change Detection; Cancer; Mammary Glands

20020028391 Hutchinson (Fred) Cancer Research Center, Seattle, WA USA
The Regulation of Human Cyclin B Protein Levels by the Ubiquitin Proteolytic Pathway ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Singer, Jeffrey D.; Roberts, James M.; Sep. 2001; 29p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8085
Report No.(s): AD-A398680; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cyclin E is an unstable protein that is degraded in a ubiquitin- and proteasome-dependent pathway. Two factors stimulate cyclin E ubiquitination in vivo: when it is free of its CDK partner, and when it is phosphorylated on threonine 380. We pursued the first of these pathways by using a two-hybrid screen to identity proteins that could bind only to free cyclin E. This resulted

in the isolation of human Cul-3, a member of the cullin family of E3 ubiquitin-protein ligases. We found that Cul-3 was bound to cyclin E but not to cyclin E-Cdk2 complexes in mammalian cells, and that overexpression of Cul-3 increased ubiquitination of cyclin E but not other cyclins. Conversely, deletion of the Cul-3 gene in mice caused increased accumulation of cyclin E protein, and had cell-type specific effects on S phase regulation. In the extra-embryonic ectoderm, where cells undergo a standard mitotic cycle, there was a greatly increased number of cells in S phase. In the trophectoderm, where cells go through endocycles, there was a block to entry into S phase.
DTIC
Proteins; Cancer; Mammary Glands

20020028392 Albert Einstein Coll. of Medicine, New York, NY USA
Does HERV-K Cause a Fraction of Human Breast Cancer ***Final Report, 18 Sep. 2000-17 Sep 2001***
Lenz, Jack; Oct. 2001; 11p; In English
Contract(s)/Grant(s): DAMD17-00-1-0601
Report No.(s): AD-A398679; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
HERV-K is an endogenous retrovirus of humans that is related to MMTV, the mammary carcinogenic virus of mice, and type-D primate retroviruses. All humans inherit about 30 HERV-K proviruses (retrovirus DNA genomes integrated into the DNA of the host) in germline DNA from their parents. Experiments were undertaken to test whether HERV-K can cause breast cancer in humans today. The genomes of primary breast tumor cells were searched for somatically acquired HERV-K proviruses in samples of human breast tumors. In a set of 17 such samples, no somatically acquired proviruses were detected. However, this work did lead to the discovery of the first germline insertional polymorphisms of endogenous retroviruses in humans (HERV-K proviruses that are in some people but not others), an important result that emphasizes the recent ability of this retrovirus to infect humans. In summary, results to date show that HERV-K is likely capable of reinfecting humans today, but there is no evidence yet for a role in breast cancer. Examination of additional breast carcinoma samples is continuing.
DTIC
Mammary Glands; Viruses; Cancer

20020028394 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Revascularization for Chronic Mesentric Ishemia Comparison of Endovascular and Open Surgical Intervention
Bowser, Andrew N.; Jan. 2002; 2p; In English
Report No.(s): AD-A398688; AFIT-CI02-4; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The purpose of this report is to compare the patient groups and outcome following treatment of symptomatic chronic mesenteric ischemia using percutaneous angioplasty/stenting (PAS) or open surgical reconstruction
DTIC
Ischemia; Cardiovascular System

20020029725 Colorado Univ., Health Sciences Center, Denver, CO USA
Hedgehog Signal Transduction Inhibitors in Breast Cancer Treatment and Prevention ***Annual Report, 15 Jul. 2000 - 14 Jul. 2001***
Lewis, Michael T., Colorado Univ., USA; Jul. 2001; 84p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0477
Report No.(s): AD-A398338; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Mutations in at least two hedgehog signal transduction network genes lead to defects in mammary gland development. These mutations can cause enhanced hedgehog signaling in some organs. If this mechanism is functioning in the mammary gland, defects should be inhibited or reverted by treatment with specific inhibitors of hedgehog signaling. One such inhibitor is called cyclopamine which causes birth defects in sheep when ingested during pregnancy. We are using slow-release pellets containing cyclopamine to test whether developmental defects can inhibit or revert defects caused by mutations in the hedgehog network. These mutations include null alleles for Ptcl and Gli2 as well as a constitutively activated form of Smo. As controls we are also testing the in vivo effect of cyclopamine treatment on preneoplastic growths presumably caused by genetic alterations independent of hedgehog signaling. The effect of cyclopamine on normal mammary development and function is also being examined. Finally, we are testing the effect of cyclopamine on a series of human mammary epithelial cell lines for changes in their growth behavior. if cyclopamine can slow or prevent neoplastic growth, this class of inhibitors may be useful in breast cancer treatment or prevention.
DTIC
Cancer; Inhibitors; Mammary Glands; Genes; Mutations

20020029726 Duke Univ., Medical Center, Durham, NC USA

Genomic Imprinting of the M6P/IGF2 Receptor: A Novel Breast Cancer Susceptibility Mechanism ***Final Report, 1 Jul. 1998-30 Jun. 2001***

Jirtle, Randy L.; Jul. 2001; 29p; In English

Contract(s)/Grant(s): DAMD17-98-1-8305

Report No.(s): AD-A398340; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Genomic imprinting is an epigenetic phenomenon in mammals that results in the differential expression of the paternally and maternally inherited alleles of a gene. Imprinted genes normally function to control embryonic growth and development. They also are involved in cancer because their functional haploid state makes them vulnerable to being either inactivated or overexpressed. The M6P/IGF2R has been shown to suppress cancer cell growth and is mutated in a number of human cancers, including those that develop in the lung, liver, colon and breast. These findings are consistent with the M6P/IGF2R functioning normally as a tumor suppressor. We have shown that M6P/IGF2R imprinting and receptor IGF2 binding evolved in an ancestor common to marsupials and eutherian mammals. Although M6P/IGF2R is imprinted in lower eutherian mammals, we have demonstrated that it is not imprinted in humans, clarifying previous misconceptions in the literature regarding its imprint status. Our results with breast cancer and Wilms tumor suggest that a mutational event within intron 10 of the M6P/IGF2R, and not disregulation of imprinting, may have resulted in the aberrant monoallelic expression observed in some humans. Therefore, although the M6P/IGF2R normally functions as a tumor suppressor in lung, liver, colon and breast cancer, genomic imprinting at this locus is not involved in the etiology of tumorigenesis.

DTIC

Genome; Cancer; Mammary Glands; Genes; Genetic Code

20020029729 Kentucky Univ., Research Foundation, Lexington, KY USA

Research Training in Biopsychosocial Breast Cancer Research ***Annual Report, 1 Jul. 2000 - 30 Jun. 2001***

Andrykowski, Michael A., Kentucky Univ., USA; Jul. 2001; 86p; In English

Contract(s)/Grant(s): DAMD17-99-1-9245

Report No.(s): AD-A398466; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report summarizes activities and accomplishments during the second year of a 4 year training program in biopsychosocial breast cancer research. Three new trainees: (1) postdoctoral; and (2) predoctoral were appointed to the training program in July, 2000. Research training was furnished by a multidisciplinary faculty of six. The training program consists of 5 components, all of which were successfully implemented Specifically, training faculty and trainees participated in a monthly breast cancer seminar which allowed for oversight of trainee activities, didactic presentation of clinical aspects of breast cancer, and discussion of ongoing and anticipated breast cancer-related research projects. Trainees received supervised guidance in all phases of the research enterprise. Specifically, trainees participated in the development and implementation of three new research projects. Trainees also participated in data analysis and manuscript preparation for two additional breast cancer-related research projects. Both predoctoral trainees completed one required didactic course and enrolled in the second. Finally, trainees participated in breast clinic activities. Following review of their progress, all three trainees were reappointed to a second year of research training.

DTIC

Mammary Glands; Cancer; Education

20020029859 Health Canada, Safe Environments Programme, Canada

Inhalation Toxicology of Urban Ambient Particulate Matter: Acute Cardiovascular Effects in Rats, ***Dec. 1998 - Jul. 00***

Vincent, R.; Kumarathasan, P.; Goegan, P.; Bjarnason, S. G.; Guenette, J.; Oct. 2001; 78p; In English

Report No.(s): PB2002-102299; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Rats were exposed for 4 hours by inhalation to clean air, resuspended Ottawa ambient particles (48 mg/m3), water-leached ambient particles (49 mg/m3), diesel soot (5 mg/m3), or carbon black (5 mg/m3). Continuous data for physiologic endpoints were captured by telemetry and blood was sampled from jugular cannulas before and after exposure. Lung injury was assessed by 3H-thymidine autoradiography. We measured endothelins (ET) and nitric oxide-related products to assess the vasopressor and vasodilator components, respectively; and catecholamines and oxidative stressors to assess possible stress components. Absence of lung cell labeling in all groups indicated an absence of acute lung injury. Inhalation of ambient particles caused sustained elevations of ET-1, ET-2, and ET-3 at 2 hours after exposure. Exposure to diesel soot, but not carbon black, caused an elevation of ET-3 at 36 hours after exposure, but blood pressure was not affected. Our results indicate that inhalation of ambient particles can affect ET-1 and ET-3 blood levels and cause a vasopressor response without causing acute lung injury. Furthermore, the potency of the particles appeared to be modified by removing soluble elements. Because the pathophysiologic significance of

elevated endothelins has been clinically established in humans, our observations suggest a novel mechanism by which inhaled particles may cause cardiovascular effects.
NTIS
Toxicology; Autoradiography; Cardiovascular System; Air Quality

20020030288 Air Command and Staff Coll., Maxwell AFB, AL USA
The DOD Humanitarian and Civic Assistance Program Concepts, Trends, Medical Challenges
Ebling, Linda L.; Mar. 1997; 51p; In English
Report No.(s): AD-A398458; No Copyright; Avail: Defense Technical Information Center (DTIC)
The U.S. Department of Defense (DOD) supports worldwide humanitarian assistance activities as part of military operations other than war (MOOTW). This study is a qualitative and quantitative analysis of one aspect of MOOTW: the DOD Humanitarian and Civic Assistance (HCA) Program. This analysis defines and evaluates the HCA program in the context of MOOTW and proposes the emergence of several trends as well as challenges. This study also assesses the purposes and limits of HCA (under Title 10, USA Code) and differentiates between humanitarian assistance (HA) and HCA. Current trends highlight past, present, and potential benefits of this program. Challenges involve: implementing program improvements; measuring program performance and effectiveness; and defining military roles relevant to training, long term benefits, and the politico-military interface. Methodology for this study includes: (1) a literature review, (2) analysis of a 1993-94 U.S. Government General Accounting Office (GAO) report entitled Department of Defense: Weaknesses in Humanitarian and Civic Assistance Programs, (3) analysis of program data, (4) evaluation of medical after-action reports, and (5) interviews with personnel involved in various aspects of HCA. Reports on medical HCA conducted in USSOUTHCOM by medics associated with Air Force Special Operations Command (AFSOC) serve to tie together the interrelated themes of this study and support conclusions relevant to trends, benefits, challenges, suggested improvements, and suggested areas for future research.
DTIC
Personnel; Armed Forces (USA); Peacetime

20020030291 Duke Univ., Medical Center, Durham, NC USA
Analysis of the Mechanism of Action of RPF1: Potentiator of Progesterone Receptor and p53-Dependent Transcriptional Activity ***Annual Report, 1 Jul. 1998 - 30 Jun. 2001***
Huacani, Maria R., Duke Univ., USA; McDonnell, D., Duke Univ., USA; Jul. 2001; 43p; In English
Contract(s)/Grant(s): DAMD17-98-1-8072
Report No.(s): AD-A398343; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The E3 ubiquitin ligase, hRPFl/Nedd4 has been previously been described as a potentiator of progesterone receptor (PR)- and p53-dependent transcriptional activity. Given the observation that hRPFl/Nedd4 shares amino acid sequence homology with the hect' family of E3 ligases, we proposed to identify substrates of hRPFl/Nedd4 ubiquitination activity with the goal of elucidating the mechanism for these observed PR and p53 transcriptional effects. Using a yeast two-hybrid approach, we have identified hPRTB (proline-rich protein, brain expressed) as a nuclear protein which interacts with and is a ubiquitination substrate of hRPFl/Nedd4 in vitro and in cultured cells. Furthermore, with the identification of a rev-like nuclear export sequence in hRPFl/Nedd4, we suggest that nuclear import/export of distinct hect' family members will contribute to the regulation of enzyme/substrate specificity within a cell. It is now apparent the potentiative effects of hRPFl/Nedd4 upon PR- and p53-dependent transcription are independent of ubiquitination activity of this enzyme. Nonetheless, the localization of hPRTB, a ubiquitination substrate of hRPFl/Nedd4, in splicing factor-rich nuclear speckles remains suggestive of a potential link between ubiquitination and the general transcriptional machinery.
DTIC
Proteins; Steroids; Mammary Glands; Cancer; Genetics

20020030292 American Red Cross, Jerome B. Holland Lab. for Biomedical Sciences, Rockville, MD USA
Analysis of the Role of Cortactin in Tumor Cell Invasion ***Final Report, 1 Jul. 1998 - 30 Jun. 2001***
Zhan, Xi, American Red Cross, USA; Jul. 2001; 60p; In English
Contract(s)/Grant(s): DAMD17-98-1-8278
Report No.(s): AD-A398342; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Cortactin is an actin cytoskeleton associated protein, frequently amplified and overexpressed along with the chromosome 11q13 in breast cancer, and acts as a prominent substrate of protein tyrosine kinase SRc. We have hypothesized that cortactin plays a role in tumor progression by promoting metastasis. to test this hypothesis, we conducted a series of experiments aimed at characterizing the effects of cortactin and its mutant with a defect in tyrosine phosphorylation on cell motility in vitro and

metastasis in vivo. These studies have eventually led to following conclusions: (1) cortactin is primarily implicated in actin cytoskeleton reorganization rather than DNA synthesis; (2) overexpression of wild type cortactin can increase cell motility and cell shape changes in response to growth factors and reactive oxygen species in a tyrosine phosphorylation dependent manner; (3) introduction of a cortactin mutant deficient in tyrosine phosphorylation can effectively inhibit cell motility and cell shape changes and depress tumor metastasis in vivo; and (4), the primary biochemical function of cortactin is to modulate actin polymerization by regulating the activity of Arp2/3 complex, a key machinery of actin polymerization. Our studies provide first evidence for the role of actin polymerization in tumor invasion and indicate a novel approach to suppress metastasis by targeting at actin polymerization.
DTIC
Cancer; Cells (Biology); In Vitro Methods and Tests; Mammary Glands; Tumors; Genes

20020030293 Georgetown Univ., Washington, DC USA
Targeting of Oncogenic Proteins for Intracellular Degradation ***Annual Report, 1 Jul. 2000 - 30 Jun. 2001***
Byers, Stephen, Georgetown Univ., USA; Jul. 2001; 17p; In English
Contract(s)/Grant(s): DAMD17-98-1-8089
Report No.(s): AD-A398341; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

Selective depletion of intracellular oncogenic proteins is a potentially powerful tool for the treatment of breast cancer. This is usually achieved by genetic manipulation of the target gene using procedures such as gene disruption, antisense or ribozyme technologies. We now propose an alternative approach in which an oncogenic protein is specifically targeted for intracellular degradation. In order to do this we will take advantage of the permeability properties of the third helix of the antennapedia protein. This will be used to deliver a small trifunctional peptide consisting of a target protein binding peptide and a peptide designed to interact with the E2 class of ubiquitin conjugating enzymes. In this way the ubiquitin-conjugating machinery will be selectively recruited to the target protein which should then be degraded by the proteosome. We will use the cytoplasmic signaling molecule beta-catenin as a model system since its oncogenic activity is thought to be regulated at the level of protein stability and we have established that it is normally targeted for ubiquitination and proteosomal degradation. Mutations of beta-catenin which increase its protein stability are oncogenic. The beta-catenin binding peptide will be based on the region of the tumor suppressor protein APC which constitutively binds beta-catenin.
DTIC
Proteins; Mammary Glands; Cancer; Peptides

20020030295 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA
Development of Strategies to Manipulate ErbB Receptor Heterodimerization from a Quantitative Analysis of Receptor/Ligand Relationships ***Final Report, 1 Jul. 1998-30 Jun. 2001***
Lemmon, Mark A.; Jul. 2001; 49p; In English
Contract(s)/Grant(s): DAMD17-98-1-8232
Report No.(s): AD-A398353; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Members of the erbB family of receptor tyrosine kinases include the epidermal growth factor (EGF) receptor and erbB2 (also known as HER-2/Neu) that is found overexpressed in many human breast cancer cases. The aim of our studies is to understand the mechanism by which growth factors activate these receptors. If this mechanism can be understood in detail, it should be possible to design approaches to block inappropriate receptor activation, which occurs in many breast cancers. While EGF activates erbB 1 (the EGF receptor) by directly inducing its homodimerization, the same growth factor activates erbB2 by inducing the formation of hetero-oligomeric complexes between erbB 1 and erbB2. We have shown that the isolated extracellular domain of erbB 1 is sufficient for EGF-induced homodimerization of that receptor. by contrast, isolated extracellular domains are not sufficient to recapitulate the hetero-oligomerization of erbB receptors that has been observed in vivo. These findings argue that erbB receptor homo- and hetero-oligomerization occur though different mechanisms. Subsequently, using a variety of approaches for analyzing erbB receptor transmodulation in living cells, we have generated data that support a homodimer-nucleated heterotetramer model. In this case, an activated erbB 1 homodimer is the effective ligand for erbB2, and activates it. This view, although preliminary, provides new ideas for developing approaches to reverse aberrant erbB2 activation in breast cancer.
DTIC
Cancer; Mammary Glands; Quantitative Analysis; Tyrosine

20020030296 National Inst. of Health, Bethesda, MD USA

Enhancing Effect of Radiation Therapy Using Non-Steroidal Anti-Inflammatory Agents ***Annual Report, 1 Oct. 2000 - 31 Mar. 2001***

Coleman, C. N., National Inst. of Health, USA; Apr. 2001; 14p; In English

Contract(s)/Grant(s): DAMD17-98-1-8605

Report No.(s): AD-A398351; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our earlier studies demonstrated that ibuprofen sensitizes prostate carcinoma cells to radiation in vitro and in vivo. The cytotoxic and radiosensitizing effects of ibuprofen were seen at much higher concentration than that required to inhibit prostaglandin synthesis. to understand the molecular mechanisms involved in radiosensitization we examined the effects of ibuprofen on several potential cellular targets including COX-2 and transcription factor NFkB. COX-2 was constitutively expressed in PC3 cells and was further upregulated by NSAIDs. Ibuprofen inhibited constitutive as well as cytokine-' or radiation-activated NFkB in prostate cancer cells. Currently we are evaluating the effect of ibuprofen on hypoxia-induced expression of the angiogenic factor HIF-lalpha and the subsequent VEGF secretion. HIF-lalpha protein is constitutively expressed in prostate cancer cell lines under normoxic condition and is significantly upregulated by hypoxia. Ibuprofen inhibited HIF-lalpha under normoxic condition but was less effective under hypoxic condition. Ibuprofen inhibited VEGF protein under nonnoxic and hypoxic condition. We are also evaluating the effects of other NSAIDs that selectively inhibit COX-2 and have proven to be less toxic in clinic. The results from this research project can be directly translated into the clinic with a potential to improve local tumor control, to reduce toxicity and increase overall survival.

DTIC

Cancer; Prostate Gland; Radiation Therapy; Tumors

20020030297 Maryland Univ., Baltimore, MD USA

Molecular Basis of Prostate-Specific Androgen-Independent Expression of a Homeobox Gene ***Annual Report, 13 Sep. 1999-12 Mar. 2001***

Bieberich, Charles J.; Apr. 2001; 13p; In English

Contract(s)/Grant(s): DAMD17-98-1-8477

Report No.(s): AD-A398350; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of the work supported by this grant is to characterize the molecular basis of prostate specificity and androgen independence of the hoxb-13 gene with a view towards developing new treatments for advanced prostate cancer. To date, we have succeeded in generating a physical map of both the mouse and human hoxb-13 loci, and have sublconed regions both upstream and downstream of the coding region of both genes. Reporter gene constructs carrying up to 12.5 kb of the human hoxb-13 locus have been completed and transgenic mice carrying these constructs have been generated. Analyses of reporter gene expression in these mice have revealed that this region contains elements capable of directing a pattern of gene expression that recapitulates features of hoxb-13 expression but does not direct expression in the prostate gland. Transgenes carrying regions farther upstream as well as downstream of hoxb-13 loci are being constructed to widen the search for cis-acting elements that function in the prostate.

DTIC

Cancer; Gene Expression; Genes; Prostate Gland

20020030837 Maryland Univ., Baltimore, MD USA

HER2 Regulation of Angiopoietin-2: A Mechanistic Factor in Metastasis ***Annual Report, 1 Sep. 2000-1 Sep 2001***

Carter, Bradford W.; Oct. 2001; 30p; In English

Contract(s)/Grant(s): DAMD17-00-1-0240

Report No.(s): AD-A398722; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

HER2 overexpression is a poor prognostic indicator in breast cancer. HER2 amplification is associated with early tumor dissemination, rapid tumor progression, and increased invasiveness, implying that HER2 has a significant role in the metastatic phenotype. We have demonstrated the two key steps in the metastatic mechanism, angioinvasion and transendothelial migration, are augmented by HER2 expression, and we have linked Angiopoietin-2, a vascular destabilizing protein, to expression of HER2. The objective of this research is to determine if metastatic advantage of HER2 expressing cancer cells is imparted by Angiopoietin-2 production, and further to determine if overexpression of HER2 is linked to Angiopoietin-2 expression. The scope of this research begins with two assays to test angioinvasion and endothelial cell retraction, a key step in transendothelial migration. Using several strategies, the research protocol tests tumor cell production of Angiopoietin-2 or blockade of Angiopoietin-2 to determine if Angiopoietin-2 modulates the metastatic steps in question. Further, breast cancer specimens are tested for concurrent expression of HER2 and Angiopoietin-2, and also correlated with stage and grade of the tumor. In addition,

concurrent expression of related receptors (Epidermal Growth Factor receptor, HER3, and HER4) are also tested for correlation of Angiopoietin-2 expression.
DTIC
Cancer; Mammary Glands; Metastasis; Tumors; Proteins

20020031750 Air Command and Staff Coll., Maxwell AFB, AL USA
Mental Health Care--Can the USAF do More to Encourage Help Seeking Behavior
MacLeod, Craig S.; Apr. 1998; 47p; In English
Report No.(s): AD-A398565; AU/ACSC/98-174/1998-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The purpose of this research paper is to demonstrate how the USAF (United States Air Force) can take additional steps to de-stigmatize mental health treatment, and encourage help seeking behavior among its active duty members. Its aim is to spread awareness of current mental health issues, and to offer some solutions in coping with issues involved with seeking help for mental health care. This paper discusses the stigma surrounding mental health care within society and the military. The review of issues concentrates on generic and historic sources of mental health topics, as well as several primary military resources. It presents a thorough and balanced look at the current issues impacting mental health, and what has caused these issues to remain. The research then examines the initiatives the USAF has recently undertaken to address these issues. It suggests the military is not immune from the problems associated with seeking help for mental health care, and though the USAF has recognized the problems, its efforts, up until now, have not been entirely successful at de-stigmatizing the use of military care facilities for mental health care. Finally, the research suggests ways the USAF could further alleviate the problems in the future, and encourage more help seeking behavior among its members.
DTIC
Mental Health; Armed Forces (USA); Therapy

20020031756 Institute for Genomic Research, Rockville, MD USA
Shotgun Sequencing of Plasmids from Marine Sediment Bacteria: Genetic Exploration ***Final Report, 1 Jul. 1999-30 Sep. 2001***
Eisen, Jonathan; Sep. 30, 2001; 3p; In English
Contract(s)/Grant(s): N00014-99-1-0860
Report No.(s): AD-A398735; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
We have generated DNA libraries from 10+ plasmids (some samples contained more than one plasmid) and have performed enough DNA sequencing reactions on these estimated to yield approximately 5x sequence coverage. Sequence assemblies were generated for each of these and gap closure performed so far on five plasmids. These five have been analyzed using TIGR's automated bioinformatics tools. All the results are available internally and to our collaborators through a web based system.
DTIC
Plasmids; Marine Biology; Genetics; Sediments

20020032233 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA
Discovery of Peptidomimetric Antagonists of Estrogen Receptor - Coactivator Interactions: A Novel Strategy to Combat Tamoxifen Drug Resistance ***Final Report, 1 Oct. 2000-30 Sep. 2001***
Oct. 2001; 6p; In English
Contract(s)/Grant(s): DAMD17-00-1-0648
Report No.(s): AD-A398889; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
There exists an urgent need for new drugs that halt the progression of tamoxifen-resistant breast cancers. The recent discovery of peptides that block interactions between tamoxifen-bound estrogen receptors (ER) and steroid receptor coactivator (SRC) proteins bearing an MFDFF peptide motif represents an important initial step toward this goal. Since peptides do not possess sufficient metabolic stability and cellular permeability to be investigated in animal models of drug-resistant breast cancers, our laboratory is working to identify metabolically stable and cell permeable peptido (N-alkylglycine) peptidomimetics that block interactions between SRC proteins and tamoxifen-bound ERs. We are working to employ combinatorial chemical methods and rational design to discover compounds that inhibit gene expression activated by tamoxifen-bound ERs in cell culture. These compounds have the potential to allow future evaluation of this strategy in animal models of tamoxifen resistant breast cancer.
DTIC
Tolerances (Physiology); Drugs; Mammary Glands; Cancer; Estrogens; Receptors (Physiology)

20020032237 Michigan Univ., Ann Arbor, MI USA

The RhoC Transgenic Mouse as a Realistic Model of Inflammatory Breast Cancer ***Annual Report, 15 Sep. 2000-14 Sep 2001***

VAN Golen, Kenneth L.; Oct. 2001; 8p; In English

Contract(s)/Grant(s): DAMD17-00-1-0637

Report No.(s): AD-A398977; No Copyright; Avail: Defense Technical Information Center (DTIC)

Inflammatory breast cancer (IBC) affects approximately 6% of women with breast cancer annually in the USA. However, this form of locally advanced breast cancer carries with it a grave prognosis with a disease-free survival rate of less than 45%. This poor prognosis is due to the ability of the tumor to invade and grow in the dermal lymphatics. Until recently, very little was known about the genetic mechanisms involved in conferring the invasive phenotype to IBC. Our laboratory has identified the oncogene RhoC GTPase as being overexpressed in IBC patient samples as compared with stage-matched non-IBC breast tumors. Overexpression of RhoC in normal human mammary epithelial cells nearly recapitulates the IBC phenotype, namely the cells become tumorigenic and invasive. to date few models exist to study the development of IBC. We have proposed to develop a RhoC transgenic mouse which will act as a realistic model of IBC formation and development. This mouse will help to identify other molecular events in the formation of IBC and act as a model for the development of new therapies.

DTIC

Cancer; Mammary Glands

20020032270 NASA Ames Research Center, Moffett Field, CA USA

The Biology and Space Exploration Video Series

William, Jacqueline M., Lockheed Martin Engineering and Science Services, USA; Murthy, Gita, NASA Ames Research Center, USA; Rapa, Steve, NASA Ames Research Center, USA; Hargens, Alan R., NASA Ames Research Center, USA; [1995]; 2p; In English; Annual American Inst. of Aeronautics and Astronautics Meeting, 3-6 Mar. 1996, Houston, TX, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 199-26-12-34; RTOP 199-14-12-04; RTOP 307-51-12-26; No Copyright; Avail: Issuing Activity; Abstract Only

The Biology and Space Exploration video series illustrates NASA's commitment to increasing the public awareness and understanding of life sciences in space. The video series collection, which was initiated by Dr. Joan Vernikos at NASA headquarters and Dr. Alan Hargens at NASA Ames Research Center, will be distributed to universities and other institutions around the USA. The video series parallels the "Biology and Space Exploration" course taught by NASA Ames scientists at Stanford University, Palo Alto, California. In the past, students have shown considerable enthusiasm for this course and have gained a much better appreciation and understanding of space life sciences and exploration. However, due to the unique nature of the topics and the scarcity of available educational materials, most students in other universities around the country are unable to benefit from this educational experience. Therefore, with the assistance of Ames experts, we are producing a video series on selected aspects of life sciences in space to expose undergraduate students to the effects of gravity on living systems. Additionally, the video series collection contains space flight footage, graphics, charts, pictures, and interviews to make the materials interesting and intelligible to viewers.

Author

Space Exploration; Video Tapes; Life Sciences; Space Flight

20020032314 National Inst. of Health, Bethesda, MD USA

Targeting Delivery of Chemotherapeutic Agents to Mammary Tumors ***Final Report, 1 Sep. 2000-31 Aug. 2001***

Brodie, Steven G.; Sep. 2001; 15p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0640

Report No.(s): AD-A398692; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Breast cancer is the second leading cause of cancer incidence and the leading cause of cancer mortality in women. Current chemotherapeutic treatments often have adverse effects primarily caused by the inefficient delivery and/or poor specificity of the compounds to breast tissues. Overall, we were interested in determining whether current therapeutic agents be redesigned to carry 'tissue specific markers' to enhance their delivery and uptake in targeted tumor cells. In order to accomplish this goal, efficient delivery and increased specificity of chemotherapeutic agents to targeted cells must be achieved. Recently, researchers identified germline mutations in the tumor suppressor gene BRCA1 that predisposes women to early onset breast cancer. to recapitulate this condition, our laboratory generated a Brcal mouse model that selectively develops mammary tumors between 6-9 months of age. Using this Brca1 breast cancer model and cell lines derived from mammary tumors, phage display was used to isolate and identify peptide motifs that selectively bind to cultured Brcal mammary tumor cell lines. Next, the identified candidate peptides were

conjugated to a tracer and tested for in vitro and in vivo efficiency and specificity of delivery toward mammary tumor cell lines and mammary tissues.
DTIC
Cancer; Cells (Biology); Chemotherapy; Mammary Glands; Peptides; Tumors

20020032316 Pennsylvania Univ., Medical Image Processing Group, Philadelphia, PA USA
MRI-Based Screen for Breast Cancer Patients Carrying a Breast Susceptibility Gene ***Final Report, 15 Sep. 1996-31 Jul. 2001***
Schnall, Mitchell D.; Jul. 2001; 19p; In English
Contract(s)/Grant(s): DAMD17-96-C-6059
Report No.(s): AD-A398696; No Copyright; Avail: Defense Technical Information Center (DTIC)
We have successfully performed an MR (magnetic resonance) screening study on 181 patients at high risk for breast cancer that did not have an actionable mammogram or clinical finding prior to study entry. Abnormal MRI (magnetic resonance imaging) findings prompted a total of 31 biopsies, six of which yielded malignant findings. The cancer yield of the MRI screen was 3.3% of the women, and 1.8% of the exams (2.2% for the initial screens and 1.1% of the follow up screens). The false negative rate of MRI with a variable follow up was 1/7 (14%). Although the data needs to be confirmed with larger studies, this data suggests that MRI may be a valuable tool for screening women at high risk for breast cancer.
DTIC
Cancer; Magnetic Resonance; Medical Services; Mammary Glands; Genes

20020032325 Washington Univ., Saint Louis, MO USA
Role of Nkx3.1 Homeodomain Protein in Prostate Carcinogenesis and Differentiation ***Final Report, 15 Jan. 1999-14 Jul. 2001***
Milbrandt, Jeffrey; Svaren, John; Araki, Toshi; Nagarajan, Rakesh; Fahrner, Tim; Aug. 2001; 7p; In English
Contract(s)/Grant(s): DAMD17-99-1-9026
Report No.(s): AD-A398754; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Cancer of the prostate is the second most common cause of cancer morbidity and mortality in American males, currently accounting for 30% of new cancer cases in this population. The chromosomal region most frequently involved in prostate cancer is located at 8p12-22; indeed, a recent study showed that 63% of premalignant PIN foci have suffered chromosome deletions at this locus. One strong candidate for a gene involved in prostate cancer at this locus is the recently described Nkx3.1 gene, which encodes a homeodomain transcription factor. Studies of Nkx3.1-deficient mice have shown that the loss of a single allele is sufficient to promote hyperplasia in the prostate epithelium, indicating its potential role in prostate cancer initiation. to identify genes regulated by Nkx3.1, we have infected prostate carcinoma cells with adenovirus expressing Nkx3.1 and analyzed the changes in gene expression using microarray methodology. Immunohistochemistry using anti-Nkx3.1 antibodies was used to demonstrate that Nkx3.1 is expressed in luminal epithelial cells but not in basal, neuroendocrine or stromal cells. We examined Nkx3.1 expression in human prostate tumors and found that it was absent in the malignant cells in 60% of the tumor samples.
DTIC
Cancer; Carcinogens; Prostate Gland; Proteins; Genes

20020032590 NASA Ames Research Center, Moffett Field, CA USA
Development of an Automated Seed Sowing and Induced Germination System for Space Flight Application
Heyenga, A. G., National Academy of Sciences - National Research Council, USA; Kliss, Mark, NASA Ames Research Center, USA; [1995]; 1p; In English; American Society of Gravitational and Space Biology Conference, 25-29 Oct. 1995, Washington, DC, USA; Sponsored by American Society for Gravitational and Space Biology, USA
Contract(s)/Grant(s): RTOP 106-20-07; No Copyright; Avail: Issuing Activity; Abstract Only
The successful utilization of higher plants in space flight is likely to require the effective transition of plants through all phases of growth and development. A particularly sensitive and critical stage in this cycle is seed germination. The present inflight capability to manipulate seed from a state of dormancy to germination and the performance of such activity under aseptic conditions is extremely limited. An Automated Sowing Mechanism (ASM) has been designed to address this area of science and technology. The self-contained system is readily compatible with the existing Shuttle middeck locker Plant Growth Unit (PGU) and planned Plant Growth Facility (PGF), presenting an opportunity to extend the experimental capability of these systems. The ASM design encompasses the controlled transition of seed from a dry to hydrated state utilizing solid media substrate as the source of water and nutrient support. System activation has been achieved with both photo and timing mechanisms. Controlled induced

germination and development of various plant species has been achieved in ground-based trials. The system is presently being prepared for a KC-135 flight test.
Author
Germination; Automatic Control; Vegetation Growth; Space Flight

20020032688 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Acoustic Sensor for Health Status Monitoring
Scanlon, Michael V.; Jan. 01, 1998; 19p; In English; Original contains color images
Report No.(s): AD-A398960; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
ARL is developing sensor technology to monitor a soldier's health and activity by gathering and analyzing acoustic data. The sensor consists of a fluid or gel contained within a small conformable rubber bladder or pad that also includes a hydrophone. This enables the collection of high signal-to-noise ratio heartbeat, breath, voice, and other physiology. The pad also minimizes interference from ambient noise due to its poor coupling with airborne noise. When the sensor pad is in contact with a patient's thorax neck or temple region sounds can be immediately and continuously monitored.
DTIC
Signal Detectors; Acoustics; Systems Health Monitoring

20020033026 General Accounting Office, Washington, DC USA
VA AND DEFENSE HEALTH CARE: Progress Made, but DOD Continues to Face Military Medical Surveillance System Challenges
Bascetta, Cynthia A.; Jan. 2002; 13p; In English; Testimony Before the Subcommittee on Health, Committee on Veteran's Affairs, House of Representatives
Report No.(s): AD-A398523; GAO-02-377T; No Copyright; Avail: Defense Technical Information Center (DTIC)
This statement concerns the record on the Department of Defense's (DOD) efforts to establish a medical surveillance system that enables DOD along with the Department of Veterans Affairs (VA) to respond to the health care needs of our military personnel and veterans. A medical surveillance system involves the ongoing collection and analysis of uniform information on deployments, environmental health threats, disease monitoring, medical assessments, and medical encounters. It is also important that this information be disseminated in a timely manner to military commanders, medical personnel, and others. DOD is responsible for developing and executing this system and needs this information to help ensure the deployment of healthy forces and the continued fitness of those forces. VA also needs this information to fulfill its missions of providing health care to veterans, backing up DOD in contingencies, and adjudicating veterans claims for service-connected disabilities. Scientists at VA, DOD, and other organizations also use this information to conduct epidemiological studies and research.
DTIC
Medical Services; Armed Forces (USA)

20020033032 NASA Ames Research Center, Moffett Field, CA USA
Sensor Systems for Space Life Sciences
Somps, Chris J., NASA Ames Research Center, USA; Hines, John W., NASA Ames Research Center, USA; [1995]; 1p; In English; Advanced Technology Applications to Combat Casualty Care Workshop, 17-18 May 1995, Silver Spring, MD, USA
Contract(s)/Grant(s): RTOP 106-20-08-01; No Copyright; Avail: Issuing Activity; Abstract Only
Sensors 2000! (S2K!) is a NASA Ames Research Center engineering initiative designed to provide biosensor and bio-instrumentation systems technology expertise to NASA's life sciences spaceflight programs. S2K! covers the full spectrum of sensor technology applications, ranging from spaceflight hardware design and fabrication to advanced technology development, transfer and commercialization. S2K! is currently developing sensor systems for space biomedical applications on BION (a Russian biosatellite focused on Rhesus Monkey physiology) and NEUROLAB (a Space Shuttle flight devoted to neuroscience). It's Advanced Technology Development-Biosensors (ATD-B) project focuses efforts in five principle areas: biotelemetry Systems, chemical and biological sensors, physiological sensors, advanced instrumentation architectures, and data and information management. Technologies already developed and tested included, application-specific sensors, preamplifier hybrids, modular programmable signal conditioners, power conditioning and distribution systems, and a fully implantable dual channel biotelemeter. Systems currently under development include a portable receiver system compatible with an off-the-shelf analog biotelemeter, a 4 channel digital biotelemetry system which monitors pH, a multichannel, g-processor based PCM biotelemetry system, and hand-held personal monitoring systems. S2K! technology easily lends itself to telescience and

telemedicine applications as a front-end measurement and data acquisition device, suitable for obtaining and configuring physiological information, and processing that information under control from a remote location.
Author
Fabrication; Life Sciences; Sensors; Aerospace Medicine; Biotelemetry; Space Flight

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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.

20020027462 Bionetics Corp., Moffett Field, CA USA
Multi-Segment Hemodynamic and Volume Assessment With Impedance Plethysmography: Aerospace Applications
Ku, Yu-Tsuan E., Bionetics Corp., USA; Montgomery, Leslie D., Bionetics Corp., USA; [1995]; 1p; In English; 9th International Conference on Electrical Bio-Impedance, 26-30 Sep. 1995, Heidelberg, Germany
Contract(s)/Grant(s): RTOP 199-61-62; No Copyright; Avail: Issuing Activity; Abstract Only

Definition of multi-segmental circulatory and volume changes in the human body provides an understanding of the physiologic responses to various aerospace conditions. We have developed instrumentation and testing procedures at NASA Ames Research Center that may be useful in biomedical research and clinical diagnosis. Specialized two, four, and six channel impedance systems will be described that have been used to measure calf, thigh, thoracic, arm, and cerebral hemodynamic and volume changes during various experimental investigations.
Derived from text
Aerospace Engineering; Hemodynamic Responses; Impedance; Plethysmography; Cardiovascular System; Human Body

20020027687 Army Research Inst. of Environmental Medicine, Thermal and Mountain Medicine Div., Natick, MA USA
Effect of Acetazolamide on Isolated Quadriceps Muscle Endurance Performance at Sea Level and During Acute Altitude Exposure
Fulco, Charles S.; Ditzler, Dan; Soares, Robert; Lammi, Eric; Muza, Steven R.; Degroot, David W.; Feb. 2002; 33p; In English
Report No.(s): AD-A398545; USARIEM-TR-T02/9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Acetazolarnide (AZ) can be taken at sea level (SL) to prevent acute mountain sickness during subsequent altitude (ALT) exposure. AZ causes metabolic acidosis at SL and ALT, and increases arterial oxygen saturation (SaO2) at ALT. HYPOTHESIS: AZ will impair muscle endurance at SL but not ALT (4300 m, is less than 3 h). METHODS: Six subjects (2012 yr; Xl SD) performed exhaustive constant work rate 1-leg knee extension exercise (2512 watts) once per wk for 4 wks (2 wks at SL and 2 wks at ALT). Each week, subjects took either AZ (250 mg) or placebo orally (double blind) every 8 h starting one-day prior to exercise. All exercise bouts began 3 h after the last (i.e., 4th) dose and 2 bouts began 2 h after ALT exposure. RESULTS: AZ caused similar acidosis in the same subjects at SL and ALT, but muscle endurance was impaired only at SL. CONCLUSION: Lack of endurance impairment at ALT during AZ was likely due to offsetting secondary effects resulting from the acidosis (e.g., increased SaO2) that improved muscle oxygen delivery.
DTIC
Muscles; Acetazolamide; Muscular Function; Altitude Sickness

20020028160 Army Research Inst. of Environmental Medicine, Natick, MA USA
Effects of Intermittent Altitude Exposures on Acclimatization of 4,300 M
Beidleman, Beth A.; Muza, Stephen R.; Fulco, Charles S.; Cymerman, Allen; Ditzler, Daniel T.; Nov. 2001; 98p; In English
Report No.(s): AD-A398658; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This study examined the effects of three weeks of intermittent exposures (4 h/d, 5 d/wk) to 4,300 m altitude-equivalent, in combination with either passive sitting or exercise training, on the process of altitude acclimatization. Physiological, hematological, physical work performance, and acute mountain sickness (AMS) responses elicited by intermittent exposures to altitude were compared to previously published data from chronic altitude residence. Six adult lowlanders (30 +/- 2 yrs; 70 +/- 3 kg) were acutely exposed (i.e., 30 h) to 4,300 m altitude-equivalent once before (PreAc) and once after (PostAc) a three-week period of intermittent altitude exposures. Exercise training during intermittent exposures to altitude did not enhance the magnitude of altitude acclimatization. Thus, data from both groups were combined. Three weeks of intermittent altitude exposures resulted in an 11% increase in resting ventilation, 18% increase in maximal oxygen uptake (VO2(sub max)), 21% improvement in

whole-body submaximal endurance performance, 26% increase in small-muscle endurance performance, and elimination of AMS symptoms from PreAc to PostAc. Intermittent altitude exposures accomplished 50%-100% of the expected adaptation to altitude, based on improvements in submaximal endurance performance and absence of altitude illness, when compared to previous chronic altitude residence studies. These large improvements in physical work performance and AMS symptomatology appear to be related to the large degree of ventilatory acclimatization achieved after three weeks of intermittent altitude exposures. Our findings suggest that three weeks of intermittent altitude exposures is a useful tool for enhancing physical work performance and eliminating symptoms of AMS in less total exposure hours than chronic altitude residence.
DTIC
Altitude Acclimatization; Exposure; Physical Work; Physiology

20020030098 Wyle Life Sciences, Inc., Houston, TX USA
KC-135 and Other Microgravity Simulations, *Jan. - 15 Jun. 2001*
Skinner, Noel C., Wyle Life Sciences, Inc., USA; August 2001; 248p; In English
Report No.(s): NASA/CR-2001-208929; NAS 1.26:208929; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
This document represents a summary of medical and scientific evaluations conducted aboard the KC-135 from January to June 15, 2001. Included is a general overview of KC-135 activities manifested and coordinated by the Human Adaptation and Countermeasures Office. A collection of brief reports that describes tests conducted aboard the KC-135 follows the overview. Principal investigators and test engineers contributed significantly to the content of the report describing their particular experiment or hardware evaluation. Although this document follows general guidelines, each report format may vary to accommodate differences in experiment design and procedures. This document concludes with an appendix that provides background information concerning the KC-135 and the Reduced-Gravity Program.
Author
C-135 Aircraft; Microgravity; Human Performance; Gravitational Effects

20020030124 California Univ., Dept. of Radiology, San Francisco, CA USA
Sub-regional Assessment of Bone Loss in the Axial Skeleton in Long-Term Spaceflight *Monthly Report, 1-31 Jan. 2002*
Lang, Thomas F., California Univ., USA; Mar. 08, 2002; 2p; In English
Contract(s)/Grant(s): NAS9-99055
Report No.(s): NAS-9-990055-37; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
No scanning was performed this month. At this point, 14 subjects are enrolled in the program 11 have received baseline measurements. Five subjects have completed the pre-flight and return CT scans. The accomplishments of the study up to this point are described in the Operational Accomplishments Report submitted to Dr. Lakshmi Putcha for the Increment 3 flight.
Derived from text
Bone Demineralization; Musculoskeletal System; Space Flight

20020030264 Naval Postgraduate School, Monterey, CA USA
Modeling the Biodynamical Response of the Human Head for Injury Analysis
George, Danielle N.; Sep. 2001; 106p; In English
Report No.(s): AD-A397540; No Copyright; Avail: Defense Technical Information Center (DTIC)
The objective of this study is to develop a finite element model of the human head and neck to investigate the biomechanics of head injury. The finite element model is a two-dimensional, plane strain representation of the cervical spine, skull, and major components of the brain including the cerebrum, cerebellum, brain stem, tentorium, and the surrounding cerebral spinal fluid. The dynamic response of the model is validated by comparison with the results of human volunteer sled acceleration experiments conducted by Ewing et al.. To validate the head model, one of the head impact experiments performed on cadavers by Nahum et al., is simulated. The model responses are compared with the measured cadaveric test data in terms of head acceleration, and intracranial pressures measured at four locations including the coup and contrecoup sites. The validated model is used to demonstrate that the Head Injury Criterion (HIC), which is based on resultant translational acceleration of the center of gravity of the head, does not relate to the various mechanisms of brain injury and is therefore insufficient in predicting brain injury.
DTIC
Biodynamics; Brain; Dynamic Response; Injuries; Mathematical Models; Spine; Skull

20020030335 NASA, Washington, DC USA

Aerospace Technology Innovation, Volume 10

Turner, Janelle, Editor, NASA, USA; Cousins, Liz, Editor, National Technology Transfer Center, USA; Bennett, Evonne, Editor; Vendette, Joel, Editor; West, Kenyon, Editor; January/February 2002; 20p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Whether finding new applications for existing NASA technologies or developing unique marketing strategies to demonstrate them, NASA's offices are committed to identifying unique partnering opportunities. Through their efforts NASA leverages resources through joint research and development, and gains new insight into the core areas relevant to all NASA field centers. One of the most satisfying aspects of my job comes when I learn of a mission-driven technology that can be spun-off to touch the lives of everyday people. NASA's New Partnerships in Medical Diagnostic Imaging is one such initiative. Not only does it promise to provide greater dividends for the country's investment in aerospace research, but also to enhance the American quality of life. This issue of Innovation highlights the new NASA-sponsored initiative in medical imaging. Early in 2001, NASA announced the launch of the New Partnerships in Medical Diagnostic Imaging initiative to promote the partnership and commercialization of NASA technologies in the medical imaging industry. NASA and the medical imaging industry share a number of crosscutting technologies in areas such as high-performance detectors and image-processing tools. Many of the opportunities for joint development and technology transfer to the medical imaging market also hold the promise for future spin back to NASA.
Derived from text

Imaging Techniques; Technology Transfer; Technology Utilization; Medical Science

20020032589 NASA Ames Research Center, Moffett Field, CA USA

Sex Differences in Tibial Bone Strength

Arnaud, Sara B., NASA Ames Research Center, USA; Hutchinson, T. M., Stanford Univ., USA; Torikoshi, S., Stanford Univ., USA; Hutchinson, K. J., Stanford Univ., USA; Hargens, Alan R., NASA Ames Research Center, USA; Steele, C. R., Stanford Univ., USA; [1995]; 1p; In English; Aviation, Space and Environmental Medicine Meeting, 6-9 May 1996, Atlanta, GA, USA; Sponsored by Aerospace Medical Association, USA

Contract(s)/Grant(s): RTOP 199-26-12-02; RTOP 199-26-12-34; No Copyright; Avail: Issuing Activity; Abstract Only

We have used an instrument (MRTA or Mechanical Response Tissue Analyzer) that measures bending stiffness (EI) non-Invasively to evaluate the strength of the tibia, a long bone in the weightbearing skeleton highly vulnerable to mineral loss during space flight. In healthy men, we found asymmetry in EI consistent with the bone's support function (L greater than R). In this study, we analyzed EI in women and compared the results to those in men.
Author (revised)

Musculoskeletal System; Tibia; Stiffness; Human Beings

53
BEHAVIORAL SCIENCES

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

20020027678 NASA Ames Research Center, Moffett Field, CA USA

Object Detection in Natural Backgrounds Predicted by Discrimination Performance and Models

Ahumada, A. J., Jr., NASA Ames Research Center, USA; Watson, A. B., NASA Ames Research Center, USA; Rohaly, A. M., Army Research Lab., USA; [1995]; 1p; In English; 1995 European Conference on Visual Perception, 21-25 Aug. 1995, Tuebingen, Germany

Contract(s)/Grant(s): RTOP 505-64-53; No Copyright; Avail: Issuing Activity; Abstract Only

In object detection, an observer looks for an object class member in a set of backgrounds. In discrimination, an observer tries to distinguish two images. Discrimination models predict the probability that an observer detects a difference between two images. We compare object detection and image discrimination with the same stimuli by: (1) making stimulus pairs of the same background with and without the target object and (2) either giving many consecutive trials with the same background (discrimination) or intermixing the stimuli (object detection). Six images of a vehicle in a natural setting were altered to remove the vehicle and mixed with the original image in various proportions. Detection observers rated the images for vehicle presence. Discrimination observers rated the images for any difference from the background image. Estimated detectabilities of the vehicles were found by maximizing the likelihood of a Thurstone category scaling model. The pattern of estimated detectabilities is similar for discrimination and object detection, and is accurately predicted by a Cortex Transform discrimination model. Predictions of

a Contrast- Sensitivity- Function filter model and a Root-Mean-Square difference metric based on the digital image values are less accurate. The discrimination detectabilities averaged about twice those of object detection.
Author
Probability Theory; Estimating; Image Analysis

20020028365 NASA Ames Research Center, Moffett Field, CA USA
Simulating Human Cognition in the Domain of Air Traffic Control
Freed, Michael, Western Aerospace Labs., Inc., USA; Johnston, James C., NASA Ames Research Center, USA; [1995]; 1p; In English; AIAA Symposium on Representing Mental States and Mechanisms, 27-29 Mar. 1995, Stanford, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): RTOP 505-04-12; No Copyright; Avail: Issuing Activity; Abstract Only

Experiments intended to assess performance in human-machine interactions are often prohibitively expensive, unethical or otherwise impractical to run. Approximations of experimental results can be obtained, in principle, by simulating the behavior of subjects using computer models of human mental behavior. Computer simulation technology has been developed for this purpose. Our goal is to produce a cognitive model suitable to guide the simulation machinery and enable it to closely approximate a human subject's performance in experimental conditions. The described model is designed to simulate a variety of cognitive behaviors involved in routine air traffic control. As the model is elaborated, our ability to predict the effects of novel circumstances on controller error rates and other performance characteristics should increase. This will enable the system to project the impact of proposed changes to air traffic control procedures and equipment on controller performance.
Author
Air Traffic Control; Computerized Simulation; Man Machine Systems; Human Performance; Cognition

20020029435 Office of Naval Research, Arlington, VA USA
Tactical Decision Making: The Interaction of Human Perception and Judgment with Automated Information Processing and Presentation, 1, Situational Awareness and Understanding
Marsh, Howard S., Office of Naval Research, USA; Quinn, Paul W., Office of Naval Research, USA; Toth, Gary J., Office of Naval Research, USA; Jakubek, David A., Office of Naval Research, USA; Tactical Decision Aids and Situational Awareness; January 2002, pp. 2-1 - 2-19; In English; Also announced as 20020029433; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy

Tactical decisions are made under conditions best described as "the fog and friction of war". They tend to be judgmental rather than analytical and are based on the decision maker's perception of the situation and of his or her options for meeting objectives defined by the commander. The perception and the resulting decisions are very sensitive to the quality and completeness of the knowledge that the decision maker obtains through interactions with the decision support systems. Modern information technology provides enormous potential for expanded situational awareness using a variety of information management, display, and human-system interaction tools that can help the decision makers penetrate the "fog of war" and deal with the "friction of war". On the other hand, the increased use of automation also tends to remove the decision makers from direct observation of the situation and requires them to rely on information that is derived or inferred by processes that are embedded within a complex system of systems. This can impede the judgmental decision process due to lack of confidence in the information or due to a desire to obtain more information before committing to a course of action. The relationship between the human judgmental processes and the automated decision support systems is particularly important for tactical combat direction and execution, where the pressure to decide and act is intense and where the results of decisions are often lethal. This lecture explores the process in which the decision maker achieves an awareness and understanding of the situation based on observations and on his or her model of the world and of the current operational context.
Author
Decision Making; Decision Support Systems; Sensory Perception; Situational Awareness

20020030025 Massachusetts Inst. of Tech., International Center for Air Transportation, Cambridge, MA USA
The Effect of Shared Information on Pilot/Controller Situation Awareness and Re-Route Negotiation
Farley, Todd C., Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; Endsley, Mica R., SA Technologies, USA; Amonlirdviman, Keith, Massachusetts Inst. of Tech., USA; Vigeant-Langlois, Laurence, Massachusetts Inst. of Tech., USA; [1998]; 8p; In English; 2nd USA/Europe ATM Research and Development Seminar, 1-4 Dec. 1998, Orlando, FL, USA
Contract(s)/Grant(s): NAG2-716; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The effect of shared information is assessed in terms of pilot/controller negotiation and shared situation awareness. Pilot goals and situation awareness requirements are developed and compared against those of air traffic controllers to identify areas of common and competing interest. A part-task simulator experiment is described which probes pilot/controller interaction in areas where common information has the potential to lead to contention, as identified in the comparative analysis. Preliminary results are presented which suggest that shared information can effect more collaborative interaction between pilots and air traffic controllers.
Author
Situational Awareness; Air Traffic Controllers (Personnel); Pilots (Personnel); Digital Data

20020030132 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA
An Experimental Study of the Effects of Automation on Pilot Situational Awareness in the Datalink ATC Environment
Hahn, Edward C., Massachusetts Inst. of Tech., USA; Hansman, R. John, Jr., Massachusetts Inst. of Tech., USA; May 07, 1992; 112p; In English
Contract(s)/Grant(s): NAG2-716
Report No.(s): ASL-92-1; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

An experiment to study how automation, when used in conjunction with datalink for the delivery of air traffic control (ATC) clearance amendments, affects the situational awareness of aircrews was conducted. The study was focused on the relationship of situational awareness to automated Flight Management System (FMS) programming and the readback of ATC clearances. Situational awareness was tested by issuing nominally unacceptable ATC clearances and measuring whether the error was detected by the subject pilots. The experiment also varied the mode of clearance delivery: Verbal, Textual, and Graphical. The error detection performance and pilot preference results indicate that the automated programming of the FMS may be superior to manual programming. It is believed that automated FMS programming may relieve some of the cognitive load, allowing pilots to concentrate on the strategic implications of a clearance amendment. Also, readback appears to have value, but the small sample size precludes a definite conclusion. Furthermore, because textual and graphical modes of delivery offer different but complementary advantages for cognitive processing, a combination of these modes of delivery may be advantageous in a datalink presentation.
Author
Air Traffic Control; Clearances; Flight Management Systems; Situational Awareness; Automatic Control

20020030133 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA
Variations in Party Line Information Requirements for Flight Crew Situation Awareness in the Datalink Environment
Pritchett, Amy R., Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; May 18, 1994; 124p; In English
Contract(s)/Grant(s): NAG2-716
Report No.(s): ASL-94-5; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Current Air Traffic Control communications use shared very high frequency (VHF) voice frequencies from which pilots can obtain 'Party Line' Information (PLI) by overhearing communications addressed to other aircraft. A prior study has shown pilots perceive this PLI to be important. There is concern that some critical PLI may be lost in the proposed datalink environment where communications will be discretely addressed. Different types of flight operations will be, equipped with datalink equipment at different times, generating a 'mixed environment' where some pilots may rely on PLI while others will receive their information by datalink. to research the importance, availability and accuracy of PLI and to query pilots on the information they feel is necessary, a survey was distributed to pilots. The pilots were selected from four flight operation groups to study the variations in PLI requirements in the mixed datalink environment. Pilots perceived PLI to be important overall. Specific information elements pertaining to traffic and weather information were identified as Critical. Most PLI elements followed a pattern of higher perceived importance during terminal area operations, final approach and landing. Pilots from the different flight operation groups identified some elements as particularly important. Pilots perceived PLI to be only moderately available and accurate overall. Several PLI elements received very low availability and accuracy ratings but are perceived as important. In a free response question designed to find the information requirements for global situation awareness, pilots frequently indicated a need for traffic and weather information. These elements were also frequently cited by them as information that could be presented by a datalink system. The results of this survey identify specific concerns to be addressed when implementing datalink communications.
Author
Flight Operations; Information Flow; Situational Awareness; Pilot Performance; Data Links

20020030134 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

The Effect of Shared Information on Pilot/Controller and Controller/Controller Interactions

Hansman, R. John, Massachusetts Inst. of Tech., USA; [1999]; 10p; In English; Workshop on Advanced Technologies and their Impact on Air Traffic Management in the 21st Century, 26-30 Sep. 1999, Capri, Italy

Contract(s)/Grant(s): NAG2-716; NAG2-1128; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In order to respond to the increasing demand on limited airspace system resources, a number of applications of information technology have been proposed, or are under investigation, to improve the efficiency, capacity and reliability of ATM (Asynchronous Transfer Mode) operations. Much of the attention in advanced ATM technology has focused on advanced automation systems or decision aiding systems to improve the performance of individual Pilots or Controllers. However, the most significant overall potential for information technology appears to he in increasing the shared information between human agents such as Pilots, Controllers or between interacting Controllers or traffic flow managers. Examples of proposed shared information systems in the US include; Controller Pilot Databank Communication (CPDLC), Traffic Management Advisor (TMA); Automatic Dependent Surveillance (ADS); Collaborative Decision Making (CDM) and NAS Level Common Information Exchange. Air Traffic Management is fundamentally a human centered process consisting of the negotiation, execution and monitoring of contracts between human agents for the allocation of limited airspace, runway and airport surface resources. The decision processes within ATM tend to be Semistructured. Many of the routine elements in ATM decision making on the part of the Controllers or Pilots are well Structured and can be represented by well defined rules or procedures. However in disrupted conditions, the ATM decision processes are often Unstructured and cannot be reduced to a set of discrete rules. As a consequence, the ability to automate ATM processes will be limited and ATM will continue to be a human centric process where the responsibility and the authority for the negotiation will continue to rest with human Controllers and Pilots. The use of information technology to support the human decision process will therefore be an important aspect of ATM modernization. The premise of many of the proposed shared information systems is that the performance of ATM operations will improve with an increase in Shared Situation Awareness between agents (Pilots, Controller, Dispatchers). This will allow better informed control decisions and an improved ability to negotiate between agents. A common information basis may reduce communication load and may increase the level of collaboration in the decision process. In general, information sharing is expected to have advantages for all agents within the system. However there are important questions which remain to be,addressed. For example: What shared information is most important for developing effective Shared Situation Awareness? Are there issues of information saturation? Does information parity create ambiguity in control authority? Will information sharing induce undesirable or unstable gaming behavior between agents? This paper will explore the effect of current and proposed information sharing between different ATM agents. The paper will primarily concentrate on bilateral tactical interactions between specific agents (Pilot/Controller; Controller/Controller; Pilot/Dispatcher; Controller/Dispatcher) however it will also briefly discuss multilateral interaction and more strategic interactions.

Author

Air Traffic Controllers (Personnel); Aircraft Pilots; Air Traffic Control; Asynchronous Transfer Mode; Information Transfer; Decision Making

20020030137 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA

Preliminary Analysis of Pilot Ratings of ”Party Line” Information Importance

Pritchett, Amy, Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; [1993]; 6p; In English; Seventh International Symposium on Aviation Psychology, April 1993, Columbus, OH, USA; Previously announced as 19980151209

Contract(s)/Grant(s): NAG2-716; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

With the introduction of digital data link communications into the ATC system, there is concern over the potential loss of situational awareness by flight crews due to the reduction in the ’Party Line’ Information (PLI). This information is available to the pilot by overhearing communications between ATC and other aircraft. A survey was distributed to determine current PLI use by several pilot operational groups, experience levels and geographic regions. The survey identified numerous important elements. PLI was rated the highest for operations near or on approach to the airport. Several significant variations were found between pilots from different operational groups and experience levels. Traffic and weather information were the most frequently cited as information required to obtain global situation awareness.

Author

Pilot Ratings; Data Links; Air Traffic Control; Data Transmission

20020030309 Massachusetts Inst. of Tech., Aeronautical Systems Lab., Cambridge, MA USA

Experimental Studies of Intent Information on Cockpit Traffic Displays

Barhydt, Richard, Massachusetts Inst. of Tech., USA; Hansman, R. John, Jr., Massachusetts Inst. of Tech., USA; [1997]; 6p; In English; Ninth International Symposium on Aviation Psychology, 27 Apr. - 1 May 1997, Columbus, OH, USA; Previously announced as 19980193121

Contract(s)/Grant(s): NAG2-716; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

Intent information provides knowledge of another aircraft's current and future trajectory states. Prototype traffic displays were designed for four different levels of intent: No Intent, Rate, Commanded State, and Flight Management System (FMS)-Path. The TCAS Display was used as a baseline and represents the No Intent Level. The Rate, Commanded State, and FMS-Path Displays show increasing levels of intent information using TCAS-like symbology in addition to incorporating a conflict probe and profile view display. An experiment was run on the MIT Part Task Flight Simulator in which eight airline pilots flew five traffic scenarios with each of the four displays. Results show that pilots had fewer separation violations and maneuvered earlier with the three intent displays. Separation violations were reduced when pilots maneuvered earlier. A second experiment was run to compare performance between displaying intent information directly and incorporating it into a conflict probe. A different set of eight airline pilots flew four traffic scenarios with the TCAS and Commanded State Displays with and without the conflict probe. Conflict probes with two minute and long range look-ahead times were tested. Displaying conflict bands or showing intent information directly both led to fewer separation violations and earlier avoidance maneuvers than the base TCAS Display. Performance was similar between the two minute and long range look-ahead conflict probes. Pilots preferred all intent displays over the TCAS Display.

Author

Cockpits; Display Devices; Air Traffic Control; Flight Management Systems; Information Flow

20020030334 Massachusetts Inst. of Tech., International Center for Air Transportation, Cambridge, MA USA

Situation Awareness Information Requirements for Commercial Airline Pilots

Endsley, Mica R., Massachusetts Inst. of Tech., USA; Farley, Todd C., Massachusetts Inst. of Tech., USA; Jones, William M., Massachusetts Inst. of Tech., USA; Midkiff, Alan H., Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; September 1998; 92p; In English

Contract(s)/Grant(s): NAG2-716

Report No.(s): ICAT-98-1; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Situation awareness is presented as a fundamental requirement for good airmanship, forming the basis for pilot decision making and performance. To develop a better understanding of the role of situation awareness in flying, an analysis was performed to determine the specific situation awareness information requirements for commercial aircraft pilots. This was conducted as a goal-directed task analysis in which pilots' major goals, subgoals, decisions, and associated situation awareness information requirements were delineated based on elicitation from experienced commercial airline pilots. A determination of the major situation awareness information requirements for visual and instrument flight was developed from this analysis, providing a foundation for future system development which seeks to enhance pilot situation awareness and provide a basis for the development of situation awareness measures for commercial flight.

Author

Aircraft Pilots; Pilot Performance; Situational Awareness; Decision Making

20020031251 Massachusetts Inst. of Tech., Cambridge, MA USA

The Effects of Shared Information on Pilot-Controller Situation Awareness and Re-Route Negotiation

Farley, Todd C., Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; Endsley, Mica R., SA Technologies, USA; Amonlirdviman, Keith, Massachusetts Inst. of Tech., USA; [1999]; 6p; In English; Tenth International Symposium on Aviation Psychology, 2-6 May 1999, Columbus, OH, USA

Contract(s)/Grant(s): NAG2-716; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The effect of shared information is assessed in terms of pilot-controller negotiating behavior and shared situation awareness. Pilot goals and situation awareness requirements are developed and compared against those of air traffic controllers to identify areas of common and competing interest. An exploratory, part-task simulator experiment is described which evaluates the extent to which shared information may lead pilots and controllers to cooperate or compete when negotiating route amendments. Results are presented which indicate that shared information enhances situation awareness and can engender more collaborative interaction between pilots and air traffic controllers. Furthermore, the value of providing controllers with a good-quality weather

overlay on their plan view displays is demonstrated. Observed improvements in situation awareness and separation assurance are discussed.
Author
Air Traffic Controllers (Personnel); Pilots (Personnel); Situational Awareness; Weather; Display Devices

20020031252 Georgia Inst. of Tech., Atlanta, GA USA
Pilot Non-Conformance to Alerting System Commands
Pritchett, Amy R., Georgia Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; [1997]; 6p; In English; Ninth International Symposium on Aviation Psychology, 27 Apr. - 1 May 1997, Columbus, OH, USA; Previously announced as 19980193123
Contract(s)/Grant(s): NAG2-716; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche
Instances of pilot non-conformance to alerting system commands have been identified in previous studies. Pilot non-conformance changes the final behavior of the system, and therefore may reduce actual performance from that anticipated. A simulator study has examined pilot non-conformance, using the task of collision avoidance during closely spaced parallel approaches as a case study. Consonance between the display and the alerting system was found to significantly improve subject agreement with automatic alerts. Based on these results, a more general discussion of the factors involved in pilot conformance is given, and design guidelines for alerting systems are given.
Author
Flight Simulators; Pilot Performance; Collision Avoidance; Warning Systems

20020031712 Georgia Inst. of Tech., Atlanta, GA USA
Experimental Studies of Pilot Performance At Collision Avoidance During Closely Spaced Parallel Approaches
Pritchett, Amy R., Georgia Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; [1997]; 6p; In English; Ninth International Symposium on Aviation Psychology, 27 Apr. - 1 May 1997, Columbus, OH, USA; Previously announced as 19980193358
Contract(s)/Grant(s): NAG2-716; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche
Efforts to increase airport capacity include studies of aircraft systems that would enable simultaneous approaches to closely spaced parallel runway in Instrument Meteorological Conditions (IMC). The time-critical nature of a parallel approach results in key design issues for current and future collision avoidance systems. Two part-task flight simulator studies have examined the procedural and display issues inherent in such a time-critical task, the interaction of the pilot with a collision avoidance system, and the alerting criteria and avoidance maneuvers preferred by subjects.
Author
Collision Avoidance; Pilot Performance; Aircraft Approach Spacing; Meteorology

20020032236 Oklahoma City Air Materiel Area, Directorate of Materiel Management, Tinker AFB, OK USA
Improving F-15C Air Combat Training with Distributed Mission Training (DMT) Advanced Simulation
Seaman, Keith A.; Apr. 1999; 78p; In English
Report No.(s): AD-A398924; AU/ACSC/183/1999-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
Air Combat Command is investing in Distributed Mission Training (DMT) to provide realistic mission training to the Combat Air Forces (CAF) using advances in simulation technology. DMT will network advanced simulators (and some real-world systems) to provide combat aircrews with team training in a synthetic wartime environment. F-15C units will be first in the CAF to incorporate DMT; they are confronted with developing training programs utilizing this new tool without previous experience of how to exploit the benefits of simulation for air combat training. This paper seeks to assist syllabus developers by providing a summary of lessons learned from years of air combat simulation study, and applying those lessons to DMT. A comprehensive analysis of air combat simulation training studies provides insight on how to improve F-15C air combat training using DMT. Studies not only demonstrate simulators can provide effective training, but also identify unique benefits and limitations of simulator training, and offer several training program considerations to achieve the most effective results. DMT benefits not available in flight training include unique instruction options, the capability to repeatedly practice desired tasks or missions, and the opportunity to train in complex combat scenarios. Identified limitations include sources of negative training and the lack of physiological stresses or inputs that may be desired in training. For training programs, simulator studies suggest which tasks should be emphasized in DMT, how metrics can identify training needs, who is expected to gain the most benefit from DMT, and how to intermix DMT and flight scheduling to optimize training.
DTIC
Flight Training; Armed Forces (USA); Distributed Interactive Simulation; F-15 Aircraft

20020032272 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

Identification of Important "Party Line" Information Elements and Implications for Situational Awareness in the Datalink Environment

Midkiff, Alan H., Massachusetts Inst. of Tech., USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; [1992]; 14p; In English; SAE Aerotech Conference and Exposition, 5-8 Oct. 1992, Anaheim, CA, USA; Sponsored by Society of Automotive Engineers, Inc., USA; Previously announced as 19940035065

Contract(s)/Grant(s): NAG2-716; Copyright; Avail: Issuing Activity

Air/ground digital datalink communications are an integral component of the FAA's Air Traffic Control (ATC) modernization strategy. With the introduction of datalink into the ATC system, there is concern over the potential loss of situational awareness by flight crews due to the reduction in the 'party line' information available to the pilot. Party line information is gleaned by flight crews overhearing communications between ATC and other aircraft. In the datalink environment, party line information may not be available due to the use of discrete addressing. Information concerning the importance, availability, and accuracy of party line elements was explored through an opinion survey of active air carrier flight crews. The survey identified numerous important party line elements. These elements were scripted into a full-mission flight simulation. The flight simulation experiment examined the utilization of party line information by studying subject responses to the specific information element stimuli. Some party line elements perceived as important were effectively utilized by flight crews in the simulated operational environment. However, other party line elements stimulated little or no increase in situational awareness. The ability to assimilate and use party line information appeared to be dependent on cognitive workload and the tactical/strategic nature of the situations. In addition, the results of both the survey and the simulation indicated that the importance of party line information appeared to be greatest for operations near or on the airport. This indicates that caution must be exercised when implementing datalink communications in these high workload, tactical sectors.

Author

Air Traffic Control; Situational Awareness; Data Links; Voice Communication; Pulse Communication; Pilot Performance

20020032613 NASA Ames Research Center, Moffett Field, CA USA

Cross-Cultural Barriers to Effective Communication in Aviation

Orasanu, Judith, NASA Ames Research Center, USA; Davison, Jeannie, San Jose State Univ., USA; [1995]; 1p; In English; Annual Meeting of the American Psychological Association, 15 Aug. 1995, New York City, NY, USA; Sponsored by American Psychological Association, Inc., USA

Contract(s)/Grant(s): RTOP 199-06-12-23; No Copyright; Avail: Issuing Activity; Abstract Only

Recent research on communication and performance in airline flight crews has led to a concept of shared mental models that is associated with effective, efficient team coordination in problem solving and decision making situations. Elements that characterize efficient communication have been identified. This research, however, was based strictly on US crews. More recent studies supported by NASA have identified cultural factors that influence communication among team members who vary in their status and roles. Research is just beginning to identify commonalities and culturally distinct strategies for accomplishing joint tasks. ASRS incident reports have been analyzed to identify language barriers in flight that have safety consequences. Implications of these concepts and findings for multi-cultural command and control will be explored.

Author

Aeronautics; Airline Operations; Communication

20020033025 SA Technologies, Marietta, GA USA

Shared Situation Awareness in the Flight Deck-ATC System

Endsley, Mica R., SA Technologies, USA; Hansman, R. John, Massachusetts Inst. of Tech., USA; Farley, Todd C., Massachusetts Inst. of Tech., USA; [1998]; 8p; In English; 17th Digital Avionics Systems Conference, 31 Oct. - 6 Nov. 1998, Seattle, WA, USA; Previously announced as 19990050264

Contract(s)/Grant(s): NAG2-716; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

New technologies and operational concept changes have been proposed for implementation in the National Airspace System (NAS). These changes include improved datalink (CPDLC) technologies for providing improved weather, traffic, Flight Object (FO) and navigation information to the pilot and controller, and new forms of automation for both the flight deck and air traffic management system. In addition, the way business is conducted in the NAS is under consideration. Increases in the discretion provided to pilots (and dispatchers in commercial airlines) are being contemplated in an effort to increase system capacity and flexibility. New concepts of operation (e.g., Collaborative Decision Making and Free Flight) allow for more control to be given to the cockpit or airline with correspondingly greater monitoring responsibilities on the ground. In addition, new technologies and displays make possible much greater information flow between the ground and the cockpit and also dramatic changes in the type

of information provided. Designing to support these changes suggests two integrally linked questions: (1) What display technologies and information are needed to support desired changes responsibilities? (2) How will the changes in information availability influence the negotiation process between the cockpit and the ground? Each of these proposed changes (both in technology and operational concept) will have a marked impact on the performance, workload, and Situation Awareness (SA) of both pilots and controllers. Typically such changes are evaluated independently in terms of the effects of the proposed change on either pilot performance or ATC performance. It is proposed here, however, that in order to fully understand the effects of such changes, the joint pilot/controller system must be considered.
Derived from text
Air Traffic Control; Airline Operations; Decision Making; Information Flow; Aircraft Pilots; Situational Awareness; Operators (Personnel)

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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..

20020027267 Army Research Inst. of Environmental Medicine, Natick, MA USA
Assessment of Non-Abraded Wear of Skin Exposure Reduction Paste Against Chemical Warfare Agents (SERPACWA)
Kesick, Christina M.; Latzka, William A.; McCreery, Michael J.; Robinson, Scott B.; Levine, Leslie; Jan. 2002; 19p; In English
Report No.(s): AD-A398615; USARIEM-TR-T-02/11; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Skin Exposure Reduction Paste Against Chemical Warfare Agents (SERPACWA) is an FDA-approved topical skin protectant developed to complement the use of chemical protective clothing in preventing exposure to chemical/biological warfare agents. The question of how long the protective barrier would last under non-abraded conditions over 8 h (Test 1) or 16 h (Test 2) wear-time test periods was evaluated. The purpose of the non-abraded sites was to control for any change in efficacy of SERPACWA that might have occurred over the wear time when it was not abraded. We also report the efficacy of SERPACWA when it was challenged immediately after application to the skin. Six subjects were studied in a climate-controlled mom (220-240 C, 25%-30% rh). Four sites were marked on the volar surface of each forearm (2.4cm diameter). The two proximal sites were covered to protect these sites from being abraded. One arm was treated with SERPACWA (50 mi per test site) and the other remained untreated to serve as the control. Only one of the non-abraded sites received SERPACWA prior to the wear time. After 8 h or 16 h, SERPACWA was applied to the untreated site of the SERPACWA-treated arm. A 5 mMol (1 mi) dose of methyl nicotinate (Mnic) was used as the challenge agent to evaluate the efficacy of SERPACWA. Mnic was applied to each site and removed after 2 minutes. One of the distal sites on each arm remained unchallenged to control for the differences in basal blood flow over time. Laser Doppler Imaging (LDI; perfusion units=”flux”) and visual scoring (VS) were used to quantify cutaneous erythema. LDI scans and VS were performed prior to SERPACWA application and following a 15-minute post-Mnic challenge after Test 1 and Test 2. Analysis of variance of the LDI data from the non-abraded paired sites showed that SERPACWA-treated sites had mean skin blood flow measurements 190 and 165 flux units lower than SERPACWA-untreated sites for Test 1 and Test 2
DTIC
Protective Clothing; Chemical Warfare; Blood Flow; Dosage; Exposure

20020027683 Army Aeromedical Research Lab., Fort Rucker, AL USA
Noise Protection of the HGU-56/P Aircrew Integrated Helmet System Worn with Eyeglasses ***Final Report***
Ahroon, William A.; Gordon, Elmaree; Ostler, Dale A.; Jan. 2002; 46p; In English
Report No.(s): AD-A398633; USAARL-2002-06; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The use of ancillary devices such as eyeglasses with a sound attenuating helmet can reduce the effectiveness of the helmet to protect the user from hazardous noise exposures. Three different eyeglass frame types (bayonet, cable, skull) were tested and the insertion loss (sound reduction) of the HGU-56/p Aircrew Integrated Helmet System (AIHS) worn with the frames was measured across the frequency range from 25 Hz to 20 kHz. All three types of eyeglass frames reduced the effectiveness of the AIHS to protect the wearer from noise exposure. While the limits on operational capabilities resulting from the use of cable- or skull-style eyeglass frames were minimal, the bayonet-style frames can reduce by more than half the maximum allowable time in which an individual may be exposed to high-levels of environmental noise without the added protection of insert earplugs. It is recommended that earplugs be used when bayonet-style eyeglass frames are worn with the HGU-56/p AIHS.
DTIC
Ear Protectors; Noise Reduction; Helmets; Eye Protection

20020028015 NASA Marshall Space Flight Center, Huntsville, AL USA

Materials Science Research Rack-1 Fire Suppressant Distribution Test Report

Wieland, P. O., NASA Marshall Space Flight Center, USA; January 2002; 44p; In English

Report No.(s): NASA/TM-2002-211465; M-1038; NAS 1.15:211465; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Fire suppressant distribution testing was performed on the Materials Science Research Rack-1 (MSRR-1), a furnace facility payload that will be installed in the U.S. Lab module of the International Space Station. Unlike racks that were tested previously, the MSRR-1 uses the Active Rack Isolation System (ARIS) to reduce vibration on experiments, so the effects of ARIS on fire suppressant distribution were unknown. Two tests were performed to map the distribution of CO2 fire suppressant throughout a mockup of the MSRR-1 designed to have the same component volumes and flowpath restrictions as the flight rack. For the first test, the average maximum CO2 concentration for the rack was 60 percent, achieved within 45 s of discharge initiation, meeting the requirement to reach 50 percent throughout the rack within 1 min. For the second test, one of the experiment mockups was removed to provide a worst-case configuration, and the average maximum CO2 concentration for the rack was 58 percent. Comparing the results of this testing with results from previous testing leads to several general conclusions that can be used to evaluate future racks. The MSRR-1 will meet the requirements for fire suppressant distribution. Primary factors that affect the ability to meet the CO2 distribution requirements are the free air volume in the rack and the total area and distribution of openings in the rack shell. The length of the suppressant flowpath and degree of tortuousness has little correlation with CO2 concentration. The total area of holes in the rack shell could be significantly increased. The free air volume could be significantly increased. to ensure the highest maximum CO2 concentration, the PFE nozzle should be inserted to the stop on the nozzle.

Author

International Space Station; Racks (Frames); Spacecraft Components; Fire Control; Fire Prevention

20020029438 National Aerospace Lab., Amsterdam, Netherlands

On-Board Decision Support Through the Integration of Advanced Information Processing and Human Factors Techniques: The POWER Project

Hesselink, Henk H., National Aerospace Lab., Netherlands; Zon, G. D. Rolf, National Aerospace Lab., Netherlands; Tempelman, Frank, National Aerospace Lab., Netherlands; Beetstra, Jelle W., National Aerospace Lab., Netherlands; Vollebregt, Arjen M., National Aerospace Lab., Netherlands; Hannessen, Daan P., National Aerospace Lab., Netherlands; Tactical Decision Aids and Situational Awareness; January 2002, pp. 5-1 - 5-19; In English; Also announced as 20020029433; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy

As advanced crew support technologies will be available more and more in future military aircraft, it is necessary to have a good understanding of the possibilities in this area, taking into account operational demands, technical possibilities, human factors, evaluation, and validation aspects. A Crew Assistant (CA) is a decision support system for air crew, designed to improve mission effectiveness and redistribute crew workload in such a way that the crew can concentrate on its prime tasks. The POWER (Pilot Oriented Workload Evaluation and Redistribution) project is a Netherlands National Technology Project. The project is aimed at demonstrating a generic CA environment and individual tactical decision support tools to military pilots in a simulated environment, the NSF (National Simulation Facility), a six degrees of freedom cockpit in a visual dome. The project is a technology demonstration project to show new CA features. An advanced software architecture has been set up, based on multi-agent technology, where software ”agents” co-operate in sharing information and using resources on an as-needed basis. Each agent is an autonomous piece of software that is able to anticipate courses of action and performs its function pro-actively. Several prototypes of crew assistant agents have been developed and integrated in order to facilitate a CA demonstrator A large-scale experiment with operational pilots from the Royal Netherlands Air Force (RNLAF) has been carried out to demonstrate the effects of CA technology as decision support, to validate tools, and to measure the effects of on-board decision support in enhancing pilot situational awareness. This paper describes the demonstration CA environment and provides insight into the different CA components. Part one describes the environment as a generic CA architecture that can be installed on a simple work station as well as in a full-scale simulation environment. The second part of this paper describes the aforementioned experiment, where NCMM and the contents of the experiment will be detailed.

Author

Decision Support Systems; Human Factors Engineering; Situational Awareness; Flight Crews

20020032229 Air Command and Staff Coll., Maxwell AFB, AL USA

Night Vision Goggles Computer Based Training

Waggett, Michael L.; Apr. 1999; 23p; In English; Original contains color images

Report No.(s): AD-A398875; AU/ACSC/221/1999-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

The main product of this research project is the Night Vision Goggle (NVG) Computer Based Training (CBT) program. This paper will outline the instructional design methodology used to develop the training, and the programming considerations that were used to actually build it. The Air National Guard Bureau Airspace and Ranges office requested that a CBT be built that will replace existing live training for initial NVG certification for Range Control Officers. The program was developed using Instructional Design techniques to maximize training and provide an evaluation for certification purposes. This paper will discuss the Instructional Design techniques used. A description of the instructional strategy, storyboard development, and interface development will be discussed. Hardware requirements to run the program, along with installation procedures will also be discussed. Finally, limitations and future applications of this product will also be discussed along with limitations of Computer Based Training products.
DTIC
Computer Assisted Instruction; Applications Programs (Computers); Night Vision; Goggles

20020032303 NASA Ames Research Center, Moffett Field, CA USA
Color Helmet-Mounted Display System for In-Flight Simulation on the RASCAL Research Helicopter
Edwards, Tim, Kaiser Electronics, USA; Barnhart, Warren, Kaiser Electronics, USA; Sawyer, Kevin, NASA Ames Research Center, USA; [1995]; 1p; In English; 14th DASC Digital Systems Conference and Technical Display, 5-9 Nov. 1995, Cambridge, MA, USA
Contract(s)/Grant(s): RTOP 505-59-36; No Copyright; Avail: Issuing Activity; Abstract Only
A high performance color helmet mounted display (HMD) system for in-flight simulation and research has been developed for the Rotorcraft Aircrew Systems Concepts Laboratory (RASCAL). The display system consists of a programmable display generator, a display electronics unit, a head tracker, and the helmet with display optics. The system provides a maximum of 1024 x 1280 resolution, a 4:1 contrast ratio, and a brightness of 1100fL utilizing currently available technologies. This paper describes the major features and components of the system. Also discussed are the measured performance of the system and the design techniques that allowed the development of a full color HMD.
Author
Color; Helmet Mounted Displays; In-Flight Simulation; Research Aircraft; Systems Engineering

20020032306 NASA Ames Research Center, Moffett Field, CA USA
Simulator Investigation of Pilot Aids for Helicopter Terminal Area Operations with One Engine Inoperative
Iseler, Laura, NASA Ames Research Center, USA; Chen, Robert, NASA Ames Research Center, USA; Dearing, Munro, NASA Ames Research Center, USA; Decker, William, NASA Ames Research Center, USA; [1995]; 1p; In English; AGARD Flight Vehicle Integration Panel Spring 1996 Symposium, May 1996, Ottawa, Canada; Sponsored by Advisory Group for Aerospace Research and Development, France
Contract(s)/Grant(s): RTOP 505-59-36; No Copyright; Avail: Issuing Activity; Abstract Only
Two recent piloted simulation experiments have investigated advanced display concepts applied to civil transport helicopter terminal area operations. Civil Category A helicopter operations apply to multi-engine helicopters wherein a safe recovery (land or fly out) is required in the event of a single engine failure. The investigation used the NASA Ames Research Center Vertical Motion Simulator, which has a full six degrees of freedom, to simulate the flight task as closely as possible. The goal of these experiments was to use advanced cockpit displays to improve flight safety and enhance the mission performance of Category A terminal area operations in confined areas. The first experiment investigated the use of military display formats to assist civil rotorcraft in performing a Category A takeoff in confined terminal areas. Specifically, it addressed how well a difficult hovering backup path could be followed using conventional instruments in comparison to panel mounted integrated displays. The hovering backup takeoff, which enables pilots to land back to the confined area pad in the event of an engine failure, was chosen since it is a difficult task to perform. Seven NASA and Army test pilots participated in the experiment. Evaluations, based on task performance and pilot workload, showed that an integrated display enabled the pilot to consistently achieve adequate or desired performance with reasonable pilot workload. Use of conventional instruments, however, frequently resulted in unacceptable performance (poor flight path tracking), higher pilot workload, and poor situational awareness. Although OEI landbacks were considered a visual task, the improved performance on the backup portion, in conjunction with increased situational awareness resulting from use of integrated displays, enabled the pilots to handle an engine failure and land back safely. In contrast, use of conventional instruments frequently led to excessive rates of sink at touchdown. A second simulation (in progress - July - August) is being conducted to investigate the use of advanced displays to perform vertical and short takeoffs and landings. One Engine Inoperative trajectories, which were optimized based on safety of flight restrictions, are utilized. Based on comments from the first experiment and further analytic development, appropriate fly out and approach guidance was added. Displays include conventional instruments with raw data, and the following integrated displays: multi-view and side-view hover displays based

on the Apache Pilot Night Vision System, and variations of the pathway-in-the-sky displays with a flight-path-vector, a leader and flight director modifications. Panel mounted and head-up displays are being evaluated. Engine modifications have been incorporated to simulate 30 second and 2 minute contingency power ratings. Evaluations are based on task performance and pilot workload. NASA, Army, FAA, and industry test pilots participated. Details concerning the design, conduct, and the results of the experiment will be reported in the proposed paper.
Author
Flight Simulators; Display Devices; Test Pilots; Civil Aviation; Engine Failure; Flight Operations

20020032340 Air Command and Staff Coll., Maxwell AFB, AL USA
Man's Place in Spaceplane Flight Operations: Cockpit, Cargo Bay, or Control Room?
Tobin, David M.; Apr. 1998; 59p; In English
Report No.(s): AD-A398849; AU/ACSC/285/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)
This paper begins to investigate the question: What is the proper role of humans in the operation of a military Spaceplane? All too often, the question boils down to: Should it be manned or unmanned? While it's true that some man-machine interface types require a man on-board and some don't, this manned/ unmanned oversimplification skews the true context of the issue. Therefore, this paper seeks to put man's role in military Spaceplane flight operations into a more proper perspective. Each of the paper's three objectives is achieved. The first objective is to summarize the current literature which is best characterized as a manned vs. unmanned debate. Although existing evidence suggests a manned spaceplane configuration provides maximum mission flexibility and an unmanned configuration will result in a more economical program, other factors such as flight safety and program development risk are more difficult to pin down. Neither the manned nor unmanned argument is clearly compelling, and the debate appears to be at a stalemate. The second objective is to approach the problem from a different perspective by considering an entire spectrum of man-machine interface possibilities. A generic process is presented where specific mission tasks are mapped to optimum man-machine interface choices by considering such factors as performance, cost, schedule, and risk. Viewed in this context, the optimal man-machine interface for a military Spaceplane is shown to be the result of an iterative design process and not a pre-specified system requirement. Moreover, the presence or absence of a man-on-board becomes a byproduct of a structured analysis instead of the central focus of an ad-hoc debate. Using the insights provided by this new approach, the third objective is to conduct a preliminary analysis to answer the question posed by the paper's title.
DTIC
Aerospace Planes; Military Spacecraft; Remotely Piloted Vehicles; Pilots (Personnel)

20020032686 NASA Ames Research Center, Moffett Field, CA USA
Identifying Human Factors Issues in Aircraft Maintenance Operations
Veinott, Elizabeth S., San Jose State Univ., USA; Kanki, Barbara G., NASA Ames Research Center, USA; [1995]; 1p; In English; 39th Annual Meeting of the Human Factors Society, 9-14 Oct. 1995, San Diego, CA, USA; Sponsored by Human Factors Society, USA
Contract(s)/Grant(s): NCC2-327; Copyright; Avail: Issuing Activity; Abstract Only
Maintenance operations incidents submitted to the Aviation Safety Reporting System (ASRS) between 1986-1992 were systematically analyzed in order to identify issues relevant to human factors and crew coordination. This exploratory analysis involved 95 ASRS reports which represented a wide range of maintenance incidents. The reports were coded and analyzed according to the type of error (e.g, wrong part, procedural error, non-procedural error), contributing factors (e.g., individual, within-team, cross-team, procedure, tools), result of the error (e.g., aircraft damage or not) as well as the operational impact (e.g., aircraft flown to destination, air return, delay at gate). The main findings indicate that procedural errors were most common (48.4%) and that individual and team actions contributed to the errors in more than 50% of the cases. As for operational results, most errors were either corrected after landing at the destination (51.6%) or required the flight crew to stop enroute (29.5%). Interactions among these variables are also discussed. This analysis is a first step toward developing a taxonomy of crew coordination problems in maintenance. by understanding what variables are important and how they are interrelated, we may develop intervention strategies that are better tailored to the human factor issues involved.
Author
Aircraft Maintenance; Human Factors Engineering; Aircraft Safety; Aeronautics

55
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.

20020027887 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Biosignatures and Planetary Properties to be Investigated by the TPF Mission
DesMarais, David J., NASA Ames Research Center, USA; Harwit, Martin, Cornell Univ., USA; Jucks, Kenneth, Smithsonian Astrophysical Observatory, USA; Kasting, James F., Pennsylvania State Univ., USA; Woolf, Neville, Arizona Univ., USA; Lin, Douglas, California Univ., USA; Seager, Sara, Institute for Advanced Study, USA; Schneider, Jean, Observatoire de Paris-Meudon, France; Traub, Wesley, Smithsonian Astrophysical Observatory, USA; Lunine, Jonathan I., Arizona Univ., USA; Feb. 05, 2002; 55p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS7-1407; JPL-1201749
Report No.(s): JPL-Publ-01-008; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
A major goal of Terrestrial Planet Finder (TPF) mission is to provide data to the biologists and atmospheric chemists who will be best able to evaluate the observations for evidence of life. This white paper reviews the benefits and challenges associated with remote spectroscopic observations of planets; it recommends wavelength ranges and spectral features; and it provides algorithms for detection of these features.
Author
Space Missions; Spectral Signatures; Oxygen Analyzers; Oxygen Spectra; Terrestrial Planets

20020032610 NASA Ames Research Center, Moffett Field, CA USA
Life on Mars
McKay, Christopher P., NASA Ames Research Center, USA; [1996]; 1p; In English; 8th ISSOL Conference on the Origin of Life, 7-12 Jul. 1996, Orleans, France; Sponsored by ISSOL, Unknown
Contract(s)/Grant(s): RTOP 185-52-82-04; No Copyright; Avail: Issuing Activity; Abstract Only
Although the Viking results may indicate that Mars has no life today, the possibility exists that Mars may hold the best record of the events that led to the origin of life. There is direct geomorphological evidence that in the past Mars had large amounts of liquid water on its surface. Atmospheric models would suggest that this early period of hydrological activity was due to the presence of a thick atmosphere and the resulting warmer temperatures. From a biological perspective the existence of liquid water, by itself motivates the question of the origin of life on Mars. From studies of the Earth's earliest biosphere we know that by 3.5 Gyr. ago, life had originated on Earth and reached a fair degree of biological sophistication. Surface activity and erosion on Earth make it difficult to trace the history of life before the 3.5 Gyr timeframe. If Mars did maintain a clement environment for longer than it took for life to originate on Earth, then the question of the origin of life on Mars follows naturally.
Author
Extraterrestrial Life; Mars (Planet)

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.

20020027709 Center for Mathematics and Computer Science, Amsterdam Netherlands
Equational Binary Decision Diagrams: Software Engineering
Groote, J. F.; vandePol, J. C.; Feb. 2000; 26p; In English
Report No.(s): PB2002-102025; SEN-R0006; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
We incorporate equations in binary decision diagrams (BDD). The resulting objects are called EQ-BDDs. A straightforward notion of ordered EQ-BDDs (EQ-OBDD) is defined, and it is proved that each EQ-BDD is logically equivalent to an EQ-OBDD. Moreover, on EQ-OBDDs satisfiability and tautology checking can be done in constant time. Several procedures to eliminate equality from BDDs have been reported in the literature. Typical for our approach is that we keep equalities, and as a consequence do not employ the finite domain property. Furthermore, our setting does not strictly require Ackermann's elimination of function symbols. This makes our setting much more amenable to combinations with other techniques in the realm of automatic theorem

proving, such as term rewriting. We introduce an algorithm, which for any propositional formula with equations finds an EQ-OBDD that is equivalent to it. The algorithm is proved to be correct and terminating, by means of recursive path ordering. The algorithm has been implemented, and applied to benchmarks known from literature. The performance of a prototype implementation is comparable to existing proposals.
NTIS
Algorithms; Software Engineering

20020029863 Helsinki Univ. of Technology, Electromagnetics Lab., Espoo, Finland
Static Field near Inflection Points
Sengoer, T.; Jan. 2001; 16p; In English
Report No.(s): PB2002-102522; Rept-350; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The electrostatic phenomena near the target bodies, which have inflection point are studied. The inflective coordinate systems are used to obtain the exact solutions. The Laplace's equation is solved in inflective coordinate systems by extending the standard separation method. These extensions bring out new special functions and series. The electrostatic field is calculated near inflective boundaries.
NTIS
Inflection Points; Coordinates; Targets

20020030198 Center for Mathematics and Computer Science, Amsterdam Netherlands
Role of Hermite Polynomials in Asymptotic Analysis. Modelling, Analysis and Simulation
Temme, N. M.; Lopez, J. L.; Sep. 30, 1999; 20p; In English
Report No.(s): PB2002-103676; MAS-R9926; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Hermite polynomials are considered as approximants in asymptotic representations of certain other polynomials. Examples are given for polynomials from the Askey scheme of hypergeometric orthogonal polynomials. We also mention that Hermite polynomials can be used as main approximants in uniform asymptotic representations of certain types of integrals and differential equations.
NTIS
Hermitian Polynomial; Hypergeometric Functions; Integrals

20020031146 Helsinki Univ. of Technology, Electromagnetics Lab., Espoo, Finland
Waves Near Inflection Points
Sengoer, T.; Jan. 2001; 18p; In English
Report No.(s): PB2002-102521; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The electromagnetic wave phenomena near the target bodies, which have inflection points are studied. The weighted inflective coordinate systems are used to obtain the exact solutions. The Helmholtz's equation is solved in inflective coordinate systems by extending the standard separation method. These extensions bring out new special functions and series. The electromagnetic field is calculated near inflective boundaries.
NTIS
Wave Functions; Inflection Points; Coordinates; Targets; Electromagnetic Fields

20020033034 NASA Ames Research Center, Moffett Field, CA USA
Automatic Overset Grid Generation with Heuristic Feedback Control
Robinson, Peter I., NASA Ames Research Center, USA; November 2001; 40p; In English
Contract(s)/Grant(s): RTOP 510-00-00
Report No.(s): NASA/TM-2001-210931; NAS 1.15:210931; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
An advancing front grid generation system for structured Overset grids is presented which automatically modifies Overset structured surface grids and control lines until user-specified grid qualities are achieved. The system is demonstrated on two examples: the first refines a space shuttle fuselage control line until global truncation error is achieved; the second advances, from control lines, the space shuttle orbiter fuselage top and fuselage side surface grids until proper overlap is achieved. Surface grids are generated in minutes for complex geometries. The system is implemented as a heuristic feedback control (HFC) expert system which iteratively modifies the input specifications for Overset control line and surface grids. It is developed as an extension of modern control theory, production rules systems and subsumption architectures. The methodology provides benefits over the full knowledge lifecycle of an expert system for knowledge acquisition, knowledge representation, and knowledge execution. The vector/matrix framework of modern control theory systematically acquires and represents expert system knowledge. Missing

matrix elements imply missing expert knowledge. The execution of the expert system knowledge is performed through symbolic execution of the matrix algebra equations of modern control theory. The dot product operation of matrix algebra is generalized for heuristic symbolic terms. Constant time execution is guaranteed.
Author
Expert Systems; Feedback Control; Grid Generation (Mathematics); Heuristic Methods; Structured Grids (Mathematics)

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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.

20020028797 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Non-Volatile Memory Technology Symposium 2001: Proceedings
Aranki, Nazeeh, Jet Propulsion Lab., California Inst. of Tech., USA; Daud, Taher, Jet Propulsion Lab., California Inst. of Tech., USA; Strauss, Karl, Jet Propulsion Lab., California Inst. of Tech., USA; November 2001; 204p; In English; 2nd; Non-Volatile Memory Technology Symposium, 7-8 Nov. 2001, San Diego, CA, USA; Sponsored by Aerospace and Electronic Systems Society, USA; Also announced as 20020028798 through 20020028823; Original contains color illustrations
Contract(s)/Grant(s): NAS7-1407
Report No.(s): JPL-Publ-01-15; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
This publication contains the proceedings for the Non-Volatile Memory Technology Symposium 2001 that was held on November 7-8, 2001 in San Diego, CA. The proceedings contains a a wide range of papers that cover current and new memory technologies including Flash memories, Magnetic Random Access Memories (MRAM and GMRAM), Ferro-electric RAM (FeRAM), and Chalcogenide RAM (CRAM). The papers presented in the proceedings address the use of these technologies for space applications as well as radiation effects and packaging issues.
Author
Conferences; Magnetic Storage; Ferroelectric Materials; Magnetoresistivity; Random Access Memory; Microelectromechanical Systems; CMOS

20020028798 Carnegie-Mellon Univ., Dept. of Electrical and Computer Engineering, Pittsburgh, PA USA
MEMS Memory Elements
Carley, L. Richard, Carnegie-Mellon Univ., USA; El-Sayed, Rany Tawfik, Carnegie-Mellon Univ., USA; Guillou, David F., Carnegie-Mellon Univ., USA; Alfaro, Fernando, Carnegie-Mellon Univ., USA; Fedder, Gary K., Carnegie-Mellon Univ., USA; Schlosser, Steven W., Carnegie-Mellon Univ., USA; Griffin, John L., Carnegie-Mellon Univ., USA; Nagle, David F., Carnegie-Mellon Univ., USA; Ganger, Gregory R., Carnegie-Mellon Univ., USA; Bain, James, Carnegie-Mellon Univ., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 1-5; In English; Also announced as 20020028797; Original contains color illustrations
Contract(s)/Grant(s): F30602-97-2-0323; NSF ECD-89-07068; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche
This paper presents a design example that illustrates the potential of microelectromechanical systems (MEMS) to perform the mechanical positioning required for addressing stored data and to enable an entirely new mechanism for reading and writing magnetic data. Specifically, MEMS sensors and actuators can be used to achieve active servo control of the separation between magnetic probe tips and a media surface with sub-nanometer accuracy. This allows mechanical position to be used to selectively write magnetic marks in a continuous thin-film magnetic media. In addition, MEMS sensors can be used to measure the separation between a magnetic probe tip and the media with a noise floor of roughly 22 picometers, allowing them to be used as position sensors in a magnetic force microscope (MFM) style data detection system.
Author
Memory (Computers); Microelectromechanical Systems; Computer Storage Devices; Data Storage; Positioning

20020028801 Celis Semiconductor Corp., Colorado Springs, CO USA
High-Density Ferroelectric Memories Using a One-Transistor Cell
Kamp, David A., Celis Semiconductor Corp., USA; DeVilbiss, Alan D., Celis Semiconductor Corp., USA; Derbenwick, Gary F., Celis Semiconductor Corp., USA; Gnadinger, Fred, COVA Technologies, Inc., USA; Huebner, Greg, COVA Technologies, Inc., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 25-28; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Discovery of new classes of ferroelectric materials that have low dielectric permittivities allows nonvolatile ferroelectric random access memories that use a single ferroelectric transistor for the memory storage device to become practical, providing non-destructive read out and density comparable to a Flash memory cell. Ferroelectric memories using this new memory cell have programming times orders of magnitude faster than Flash memory and are capable of providing very dense nonvolatile memory for space applications. Previous attempts to incorporate a ferroelectric material into the gate dielectric of a memory transistor have been hindered by the formation of an unwanted oxide interfacial layer between the ferroelectric material and the silicon that has made low voltage programming difficult and caused the devices to be unstable. These new ferroelectric materials allow the oxide interfacial layer to grow under the ferroelectric while maintaining low voltage programming characteristics because of the low permittivity. An underlying oxide is desirable because the low interface state density gives superior transistor channel characteristics. Memory window hysteresis of 2-3 volts on capacitor structures has been demonstrated and high-speed measurements of the ferroelectric switched charge correlate well with the observed memory window. Integrating the ferroelectric transistor into a memory array without the need for additional access devices is a challenge.
Author
Ferroelectric Materials; Ferroelectricity; Transistors; Permittivity; Memory (Computers)

20020028802 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Requirements and Usage of NVM in Advanced Onboard Data Processing Systems
Some, R., Jet Propulsion Lab., California Inst. of Tech., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 29-41; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This viewgraph presentation gives an overview of the requirements and uses of non-volatile memory (NVM) in advanced onboard data processing systems. Supercomputing in space presents the only viable approach to the bandwidth problem (can't get data down to Earth), controlling constellations of cooperating satellites, reducing mission operating costs, and real-time intelligent decision making and science data gathering. Details are given on the REE vision and impact on NASA and Department of Defense missions, objectives of REE, baseline architecture, and issues. NVM uses and requirements are listed.
Derived from text
Data Processing Equipment; Onboard Data Processing; Supercomputers; Airborne/Spaceborne Computers; Memory (Computers)

20020028803 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Europa Orbiter: Mass Memory Requirements and Status
Arens, Wayne, Jet Propulsion Lab., California Inst. of Tech., USA; Daud, Taher, Jet Propulsion Lab., California Inst. of Tech., USA; Karmon, Dan, Jet Propulsion Lab., California Inst. of Tech., USA; Nicholson, Alan, Jet Propulsion Lab., California Inst. of Tech., USA; Strauss, Karl, Jet Propulsion Lab., California Inst. of Tech., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 42-56; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This viewgraph presentation gives an overview of the Europa Orbiter's mass memory requirements and status. Details are given on the challenge of the mission to Europa, baseline size requirements, implementations considered, candidate technologies, prime technologies and methodology, and a proposed solution and implementation. Flash and non-volatile memory technologies are described.
Derived from text
Memory (Computers); Mission Planning; Requirements

20020028804 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Space Radiation Effects in Advanced Flash Memories
Johnston, A. H., Jet Propulsion Lab., California Inst. of Tech., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 58-63; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Memory storage requirements in space systems have steadily increased, much like storage requirements in terrestrial systems. Large arrays of dynamic memories (DRAMs) have been used in solid-state recorders, relying on a combination of shielding and error-detection-and correction (EDAC) to overcome the extreme sensitivity of DRAMs to space radiation. For example, a 2-Gbit memory (with 4-Mb DRAMs) used on the Clementine mission functioned perfectly during its moon mapping mission, in spite of an average of 71 memory bit flips per day from heavy ions. Although EDAC worked well with older types of memory circuits, newer DRAMs use extremely complex internal architectures which has made it increasingly difficult to implement EDAC. Some

newer DRAMs have also exhibited catastrophic latchup. Flash memories are an intriguing alternative to DRAMs because of their nonvolatile storage and extremely high storage density, particularly for applications where writing is done relatively infrequently. This paper discusses radiation effects in advanced flash memories, including general observations on scaling and architecture as well as the specific experience obtained at the Jet Propulsion Laboratory in evaluating high-density flash memories for use on the NASA mission to Europa, one of Jupiter's moons. This particular mission must pass through the Jovian radiation belts, which imposes a very demanding radiation requirement.
Derived from text
Extraterrestrial Radiation; Memory (Computers); Radiation Effects; Ionization

20020028805 NASA Goddard Space Flight Center, Greenbelt, MD USA
Evaluation of Data Retention Characteristics for Ferroelectric Random Access Memories (FRAMs)
Sharma, Ashok K., NASA Goddard Space Flight Center, USA; Teverovsky, Alexander, QSS Group, Inc., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 68-76; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Data retention and fatigue characteristics of 64 Kb lead zirconate titanate (PZT)-based Ferroelectric Random Access Memories (FRAMs) microcircuits manufactured by Ramtron were examined over temperature range from -85 C to +310 C for ceramic packaged parts and from -85 C to +175 C for plastic parts, during retention periods up to several thousand hours. Intrinsic failures, which were caused by a thermal degradation of the ferroelectric cells, occurred in ceramic parts after tens or hundreds hours of aging at temperatures above 200 C. The activation energy of the retention test failures was 1.05 eV and the extrapolated mean-time-to-failure (MTTF) at room temperature was estimated to be more than 280 years. Multiple write-read cycling (up to 3x10(exp 7)) during the fatigue testing of plastic and ceramic parts did not result in any parametric or functional failures. However, operational currents linearly decreased with the logarithm of number of cycles thus indicating fatigue process in PZT films. Plastic parts, that had more recent date code as compared to ceramic parts, appeared to be using die with improved process technology and showed significantly smaller changes in operational currents and data access times.
Author
Ceramics; Fatigue Tests; Microelectronics; Thermal Degradation; Plastics; High Temperature Tests; Data Retrieval

20020028807 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Overview of Non-Volatile Testing and Screening Methods
Irom, Farokh, Jet Propulsion Lab., California Inst. of Tech., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 87-99; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Testing methods for memories and non-volatile memories have become increasingly sophisticated as they become denser and more complex. High frequency and faster rewrite times as well as smaller feature sizes have led to many testing challenges. This paper outlines several testing issues posed by novel memories and approaches to testing for radiation and reliability effects. We discuss methods for measurements of Total Ionizing Dose (TID).
Author
Memory (Computers); Ionizing Radiation; Radiation Effects; Performance Tests

20020028808 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
An FPGA-Based Test-Bed for Reliability and Endurance Characterization of Non-Volatile Memory
Rao, Vikram, Illinois Univ., USA; Patel, Jagdish, Jet Propulsion Lab., California Inst. of Tech., USA; Patel, Janak, Illinois Univ., USA; Namkung, Jeffrey, Jet Propulsion Lab., California Inst. of Tech., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 100-106; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Memory technologies are divided into two categories. The first category, nonvolatile memories, are traditionally used in read-only or read-mostly applications because of limited write endurance and slow write speed. These memories are derivatives of read only memory (ROM) technology, which includes erasable programmable ROM (EPROM), electrically-erasable programmable ROM (EEPROM), Flash, and more recent ferroelectric non-volatile memory technology. Nonvolatile memories are able to retain data in the absence of power. The second category, volatile memories, are random access memory (RAM) devices including SRAM and DRAM. Writing to these memories is fast and write endurance is unlimited, so they are most often used to store data that change frequently, but they cannot store data in the absence of power. Nonvolatile memory technologies with better

future potential are FRAM, Chalcogenide, GMRAM, Tunneling MRAM, and Silicon-Oxide-Nitride-Oxide-Silicon (SONOS) EEPROM.
Derived from text
Random Access Memory; Read-Only Memory Devices; Reliability; Performance Tests

20020028809 Altera Corp., San Jose, CA USA
Copper/Low-k Interconnect Integration into 0.15 Micons Single Poly EEPROM Technology
Shekhar, V., Altera Corp., USA; Rahim, I., Altera Corp., USA; Lin, C. S., Taiwan Semiconductors Mfg. Co., Taiwan, Province of China; Ho, M. C., Taiwan Semiconductors Mfg. Co., Taiwan, Province of China; Sardana, C., Altera Corp., USA; Wang, Y. H., Taiwan Semiconductors Mfg. Co., Taiwan, Province of China; Thalapaneni, G., Altera Corp., USA; Kuo, D. S., Taiwan Semiconductors Mfg. Co., Taiwan, Province of China; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 108-111; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Successful and reliable integration of copper and low-k interconnect into single poly nonvolatile electrically-erasable programmable read only memory (EEPROM) technology is demonstrated for the first time. EEPROM cell reliability and performance of copper interconnect EEPROM cell is compared with aluminum interconnect EEPROM cell. Additionally, viability of replacing silicon nitride with oxynitride as a diffusion barrier layer underneath metal to prevent contamination related to charge loss from getting into EEPROM cell is discussed.
Author
Reliability; Systems Integration; Read-Only Memory Devices; Copper; Barrier Layers

20020028810 Virginia Univ., Dept. of Materials Science and Engineering, Charlottesville, VA USA
Atomic Scale Structure of Giant Magnetoresistive Multilayers: Energetic Adatom and Surfactant Effects
Zhou, X. W., Virginia Univ., USA; Zou, W., Virginia Univ., USA; Johnson, R. A., Virginia Univ., USA; Wadley, H. N. G., Virginia Univ., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 113-123; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The deposition of higher quality giant magnetoresistive (GMR) metal multilayers is essential for improving the performance of magnetic field sensors and nonvolatile random access memories. Improved performance requires reduction of both the atomic scale interfacial roughness and interlayer mixing in the as deposited films. The first step is to develop relationships between controllable process parameters and the atomic scale interfacial composition/structure. We have used atomistic simulation and controlled experiments to begin to address this issue. We show that control of the adatom energy and the use of a silver surfactant can improve the interface structure of multilayers. Increasing the adatom energy causes surface flattening due to enhanced surface reconstruction, but results in interlayer mixing due to impact induced atomic exchanges. A modulated energy deposition scheme was found to reduce both roughness and mixing. The addition of a small quantity of silver was found to reduce the activation barriers for surface atomic assembly and to enable the assembly process kinetics to be shifted to a regime where conventional deposition processes are able to create high quality interfaces.
Author
Atoms; Computer Storage Devices; Magnetoresistivity; Computerized Simulation; Deposition

20020028812 SEAKR Engineering, Inc., Centennial, CA USA
Non Volatile Memory Systems Design: Concept to Reality and Trades Along the Way
Anderson, Scott R., SEAKR Engineering, Inc., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 147-149; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

SEAKR Engineering is engaged in designing and building memory systems using non-volatile memory electronics. Primary targeted applications are highly reliable spacecraft data recorders, aircraft reconnaissance recorders, and board level products. This paper identifies the steps that SEAKR takes in determining a preferred system level solution and its implementation. Some key obstacles encountered in past programs are identified along with their solutions.
Author
Memory (Computers); Data Storage; Technology Assessment

20020028813 Aerospace Corp., El Segundo, CA USA

Experiences in Qualifying a Commercial MNOS EEPROM for Space

King, E. E., Aerospace Corp., USA; Lacoe, R. C., Aerospace Corp., USA; Eng, G., Aerospace Corp., USA; Leung, M. S., Aerospace Corp., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 151-156; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Qualifying a commercial Non-Volatile Memory (NVM) component for space poses several challenges; detailed information about the process and design is not likely to be available; long-term reliability data are uncertain or insufficient; little, if any, radiation data exist; and the data retention requirement for a space application generally exceeds ten years. In this paper, we describe our experiences in qualifying a commercial 1-Mbit electrically-erasable programmable read only memory (EEPROM) (the Hitachi HN58C1001) for space. Since the unique attribute of a NVM is its ability to retain stored data over long periods of time with no power applied to the component, our work focused on determining the data retention lifetime and developing a procedure to screen potential early failures from the part population.

Author

Memory (Computers); Data Storage; Accelerated Life Tests; Irradiation

20020028814 Irvine Sensors Corp., High Density Electronics, Costa Mesa, CA USA

Neo-Stacking of Packaged Flash Memory

Gann, Keith D., Irvine Sensors Corp., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 157-159; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

A variation on Irvine Sensors' Neo-Stacking process allows extremely dense packaging of Flash or other memory while sidestepping the problems associated with obtaining Known Good Die (KGD). Memory is often difficult or impossible to obtain in die or wafer form, and comprehensive testing and burn-in is prohibitively expensive for many applications. Readily available plastic encapsulated packaged memory chips are pre-tested and can easily be further tested and screened, speed sorted, tested over a different temperature range, etc. However, they cannot be packaged densely enough to meet the requirements for many applications. This paper describes a method for reprocessing and stacking standard packaged memory, along with support circuitry, into a chip-scale footprint with a very low profile.

Author

Chips (Memory Devices); Memory (Computers); Electronic Packaging

20020028815 NVE Corp., Eden Prairie, MN USA

High Speed MRAM Buffer for High Capacity Nonvolatile Shock Recorders

Sinclair, R., NVE Corp., USA; Beech, R., NVE Corp., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 160-164; In English; Also announced as 20020028797; Original contains color illustrations

Contract(s)/Grant(s): F29601-00-C-0194; F29601-99-C-0032; F29601-01-C-0121; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

High shock data recorders require large amounts of storage in order to capture high resolution data. Also, high speed is needed in order to record pretrigger data. Nonvolatile storage is important in order to prevent data loss. A system was developed with an 8 megabyte FLASH and a programmable logic devices (PLD) that contained a high speed static random access memory (SRAM) buffer memory. A new development in magnetoresistive random access memory (MRAM), using SDT technology along with a unique circuit design, is an ideal nonvolatile replacement for the SRAM. A new film structure and circuit design yields a memory that does not have disturb problems and that has the potential of high production yields. The memory is high speed (less than 10 nanosecond read or write), low power (less than 30 picojoule writes), has no wear out mechanism, and is inherently RAD Hard, with STD cells tested to 1 Mrad.

Author

Data Recorders; Programmable Logic Devices; Random Access Memory; Data Storage

20020028816 Celis Semiconductor Corp., Colorado Springs, CO USA

Future Development of Dense Ferroelectric Memories for Space Applications

Philpy, Stephen C., Celis Semiconductor Corp., USA; Derbenwick, Gary F., Celis Semiconductor Corp., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 167-171; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

The availability of high density, radiation tolerant, nonvolatile memories is critical for space applications. Ferroelectric memories, when fabricated with radiation hardened complementary metal oxide semiconductors (CMOS), can be manufactured and packaged to provide high density replacements for Flash memory, which is not radiation tolerant. Previous work showed ferroelectric memory cells to be resistant to single event upsets and proton irradiation, and ferroelectric storage capacitors to be resistant to neutron exposure. In addition to radiation hardness, the fast programming times, virtually unlimited endurance, and low voltage, low power operation make ferroelectric memories ideal for space missions. Previously, a commercial double level metal 64-kilobit ferroelectric memory was presented. Although the capabilities of radiation hardened wafer fabrication facilities lag behind those of the most modern commercial wafer fabrication facilities, several paths to achieving radiation tolerant, dense ferroelectric memories are emerging. Both short and long term solutions are presented in this paper. Although worldwide major semiconductor companies are introducing commercial ferroelectric memories, funding limitations must be overcome to proceed with the development of high density, radiation tolerant ferroelectric memories.
Author
Computer Storage Devices; Ferroelectric Materials; Memory (Computers); Radiation Tolerance

20020028817 COVA Technologies, Inc., Colorado Springs, CO USA
Commercialization of 1T-Cell Ferroelectric Memories for Space Applications
Gnadinger, Fred P., COVA Technologies, Inc., USA; Huebner, Gregory G., COVA Technologies, Inc., USA; Derbenwick, Gary F., Celis Semiconductor Corp., USA; Kamp, David A., Celis Semiconductor Corp., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 172-175; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

A new class of ferroelectric materials is under development with parameters ideally suited for 1T cell technology enabling low voltage operation with improved retention. This paper describes the approach taken to integrate the ferroelectric 1T cell module into a complementary metal oxide semiconductor (CMOS) process with special emphasis on radiation hardness for space applications.
Author
Commercialization; Ferroelectric Materials; CMOS; Transistors

20020028818 Philips Research Labs., Eindhoven, Netherlands
Magnetic Random Access Memory (MRAM) and Its Prospects
Lenssen, K.-M. H., Philips Research Labs., Netherlands; Persoon, E. H. J., Philips Semiconductors, Netherlands; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 177-182; In English; Also announced as 20020028797; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Recently the research and development activities concerning Magnetic Random Access Memory (MRAM) have shown an acceleration. Commercial MRAM products are planned to enter the market as early as 2004. In this paper first an overview will be given of the recent developments and the present status of MRAM. Potential issues (like thermal stability, magnetic shielding) will be discussed and some ideas for improvements will be proposed. In order to obtain indications for the most attractive MRAM application areas, the total (multi-billion-dollar) memory market can be divided in three segments: embedded memory, companion memory, and removable memory, differing in the percentage of the chip area that is occupied by memory. In each of these segments MRAM will have to compete with different types of conventional memory (that form the present solutions) and therefore will also have to meet different specifications. It is likely that two variants of MRAM will be developed: a high-performance version (with fast read and write) and a low-cost MRAM (with high density) to target the different market needs.
Author
Magnetic Storage; Random Access Memory; Technology Assessment; Magnetic Shielding; Thermal Stability

20020028819 Carnegie-Mellon Univ., Dept. of Electrical and Computer Engineering, Pittsburgh, PA USA
Vertical Magnetoresistive Random Access Memory: Promises and Challenges
Zhu, Jimmy, Carnegie-Mellon Univ., USA; Prinz, Gary A., Naval Research Lab., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 183-193; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Today, the most common archival memory in a computer system is the disk drive, in which data is stored in magnetic disks. When a computer is turned on, data is first loaded from the disk drive into the memory system, i.e., signal remote access memories (SRAMs) and dynamic RAMs (DRAMS), all of which require standby power to maintain their memory states. Since retrieving data from a disk drive is a relatively slow process (the data access time of a disk drive is at least 100,000 times slower than that of computer memory), the 'booting' period of a computer or the opening of an application can be long and frustrating. A new kind

of random access memory is on the horizon of commercialization and is being referred to as magnetic (or magnetoresistive) random access memory, or MRAM. In this new kind of memory, a bit, 0 or 1, is stored as the orientation of the magnetic moment in a small size thin film element and, since no electric power is needed to maintain the memory state, it is non-volatile. At present, they are focused toward replacing the slow and expensive FLASH memory. Some of the designs even have the potential to replace SRAM, DRAM and perhaps disk drives in some applications. The ability to use MRAM for replacing disk drives will enable the entire computer system to be made on a single silicon chip, opening a new era for portable and miniaturized computers. Here, we would like to introduce an MRAM design that is targeted for ultra-high area storage density, fast access time, low cost, robust performance, and good extendability. It is referred to as the vertical magnetoresistive random access memory, or VMRAM. Besides this design, there are three other major existing designs that have been reported in various literature. They will be briefly mentioned for performance comparison reasons.
Author
Data Processing; Random Access Memory; Magnetoresistivity

20020029266 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Overview of the Comet Nucleus TOUR Discovery Mission and a Description of Neutral Gas and Ion Measurements Planned
Mahaffy, Paul; Veverka, Joe; Niemann, Hasso; Harpold, Dan; Chiu, Mary; Reynolds, Edward; Owen, Toby; Kasprzak, Wayne; Patrick, Ed; Raaen, Eric; [2001]; 1p; In English; DPS Workshop, 27 Nov. - 1 Dec. 2001, New Orleans, LA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The CONTOUR (Comet Nucleus TOUR) Mission led by its Principal Investigator Professor Joseph Veverka of Cornell is presently under development at the Johns Hopkins Applied Physics Laboratory for launch in July of 2002 with a flyby of Comet Encke scheduled for November 3, 2003 at a solar distance of 1.07 au. A robust Whipple dust shield is designed to allow a close nucleus approach distance (less than 150 km). The 2nd nominal CONTOUR target is Comet Schwassmann-Wachmann 3, although the spacecraft can alternately be directed to a new comet if such an interesting target is discovered. CONTOUR contains 4 instruments: an imaging spectrometer (CRISP) developed at APL that will obtain both high resolution nucleus images through 8 filters and IR spectra (800 to 2550 nm) of the nucleus, a narrow field of view forward imager (CFI) to locate the target days before the encounter, a dust composition time of flight mass spectrometer (CIDA) provided by Dr. J. Kissel and von Hoemer & Sulger, GmbH, and a mass spectrometer (NGIMS) provided by Goddard Space Flight Center to measure neutral gas and ambient ions. Laboratory calibration of the NGIMS has now been completed. NGIMS also includes an in-flight calibration system that we plan to exercise before and after each comet encounter. We will provide an overview of the CONTOUR Mission and discuss more specifically the NGIMS measurement goals for this mission.
Author
Comet Nucleus Tour; Ions; Neutral Gases; NASA Space Programs; Imaging Spectrometers

20020029286 Sandia National Labs., Albuquerque, NM USA
Experiences with Prototype InfiniBand Hardware
Schutt, J. A.; Nov. 01, 2001; 31p; In English
Report No.(s): DE2001-789578; SAND2001-3387; No Copyright; Avail: Department of Energy Information Bridge

This report describes work funded under the ASCI Problem Solving Environment (PSE) sub-project High-Speed Interconnect (H.S.I). When this work was begun in FY00, we had identified an emerging technology, the InfiniBand (trademark) Architecture (IBA), which had the potential to address Sandia needs in massively parallel cluster computing. In particular, it seemed to have the potential of unifying the infrastructure for high performance messaging and high performance storage. Since every major computing vendor was a member of the InfiniBand Trade Association, there seemed to be some hope for InfiniBand to become a true commercial off-the-shelf (COTS) technology, with interoperability and enough competition to keep prices low. At the same time, we had identified a need for the Advanced Networking Department to have more Linux (trademark) kernel expertise. We had observed, for example, that network throughput didn't seem to be increasing at the same rate that processing power and network bandwidth were increasing, and the kernel (i.e. device for driver, protocol stacks) is where these meet. Linux is the operating system of choice for scientific cluster computing, with a large development community outside of Sandia. Although Linux development proceeds at a furious pace, without local kernel expertise we have no choice but to wait for others to develop solutions to our problems. With local expertise, there is some hope of tracking the latest developments and adapting them to meet Sandia's needs. Finally, we felt that the Advanced Networking Department had inadequate knowledge of Portals,

the underlying messaging technology used in various versions on Sandia's Cplant (trademark) and TFLOPS massively parallel computers.
NTIS
Architecture (Computers); Performance Tests; Data Processing; Problem Solving; Bandwidth

20020031774 Connecticut Dept. of Transportation, Div. of Research, Rocky Hill, CT USA
Development and Implementation of Digital Versatile Disc (DVD) for the Storage of Digital Photolog Images in Connecticut ***Final Report, Feb. 1999 - Jul. 2001***
Coleman, D. M.; Jul. 2001; 61p; In English
Report No.(s): PB2002-102307; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This study addresses all aspects of the application of digital versatile disc (DVD) and related digital imaging technologies as they apply to the storage and retrieval of Photolog images. Additionally, this study outlines the implementation of DVD-based workstations and network-based Photolog servers to replace the analog optical laser videodiscs, which had been the primary Photolog image storage media in Connecticut.
NTIS
Imaging Techniques; Video Disks; Workstations; Masers

20020032630 NASA Ames Research Center, Moffett Field, CA USA
RISC Processors and High Performance Computing
Saini, Subhash, Computer Sciences Corp., USA; Bailey, David H., NASA Ames Research Center, USA; [1995]; 1p; In English; Supercomputing 1995, 4-8 Dec. 1995, San Diego, CA, USA
Contract(s)/Grant(s): NAS2-12961; RTOP 536-01-50; No Copyright; Avail: Issuing Activity; Abstract Only
In this tutorial, we will discuss top five current RISC microprocessors: The IBM Power2, which is used in the IBM RS6000/590 workstation and in the IBM SP2 parallel supercomputer, the DEC Alpha, which is in the DEC Alpha workstation and in the Cray T3D; the MIPS R8000, which is used in the SGI Power Challenge; the HP PA-RISC 7100, which is used in the HP 700 series workstations and in the Convex Exemplar; and the Cray proprietary processor, which is used in the new Cray J916. The architecture of these microprocessors will first be presented. The effective performance of these processors will then be compared, both by citing standard benchmarks and also in the context of implementing a real applications. In the process, different programming models such as data parallel (CM FORTRAN and HPF) and message passing (PVM and MPI) will be introduced and compared. The latest NAS Parallel Benchmark (NPB) absolute performance and performance per dollar figures will be presented. The next generation of the NP13 will also be described. The tutorial will conclude with a discussion of general trends in the field of high performance computing, including likely future developments in hardware and software technology, and the relative roles of vector supercomputers tightly coupled parallel computers, and clusters of workstations. This tutorial will provide a unique cross-machine comparison not available elsewhere.
Author
RISC Processors; Supercomputers; Microprocessors; Architecture (Computers)

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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.

20020027230 West Virginia Univ., Dept. of Statistics and Computer Science, Morgantown, WV USA
Center of Excellence of Software Evolution ***Final Report, 1 Sep. 1996-31 Aug. 2001***
Sitaraman, Murali; Harner, E. J.; Oct. 15, 2001; 13p; In English
Contract(s)/Grant(s): DAAH04-96-1-0419
Report No.(s): AD-A398492; ARO-36364.11-RT-DPS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The broad goal of the project is to investigate techniques to minimize the soaring cost of software evolution, focusing on component-based systems where predictable behavior and performance are important. Key research results include techniques for reusable component and pattern design, formal specification of behavior and performance, modular verification of behavior and performance correctness, and principles for contract-checking components. Languages and tools that incorporate these findings are key technology transfer results. Key educational results include a formal approach and materials for teaching

component-based software engineering at the graduate and undergraduate levels in Computer Science, and statistical evaluation of the approach.
DTIC
Computer Programs; Software Engineering; Program Verification (Computers)

20020027356 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Integrating Newer Technology Software Systems into the SLAC Legacy Control System: Two Case Histories and New CMLOG Development
Laznovsky, M.; MacKenzie, R.; Chen, J.; Nov. 01, 2001; 3p; In English
Report No.(s): DE2001-789528; JLAB-ACC-01-27; DOE/ER/40150-1967; No Copyright; Avail: Department of Energy Information Bridge

It has been the goal of SLAC Controls Software to offload processing from the aging Alpha/VMA based control system onto machines that are more widely accepted and used. An additional goal has been to provide more modern software tools to our user community. This paper presents two software products which satisfy those goals.
NTIS
Data Processing; Computer Programs; Aging (Materials)

20020027464 NASA Ames Research Center, Moffett Field, CA USA
Managing Complexity in Multidisciplinary Visualization
Miceli, Kristina D., NASA Ames Research Center, USA; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 536-01-50; No Copyright; Avail: Issuing Activity; Abstract Only

As high performance computing technology progresses, computational simulations are becoming more advanced in their capabilities. In the computational aerosciences domain, single discipline steady-state simulations computed on a single grid are far from the state-of-the-art. In their place are complex, time-dependent multidisciplinary simulations that attempt to model a given geometry more realistically. The product of these multidisciplinary simulations is a massive amount of data stored in different formats, grid topologies, units of measure, etc., as a result of the differences in the simulated physical domains. In addition to the challenges posed by setting up and performing the simulation, additional challenges exist in analyzing computational results. Visualization plays an important role in the advancement of multidisciplinary simulations. to date, visualization has been used to aid in the interpretation of large amounts of simulation data. Because the human visual system is effective in digesting a large amount of information presented graphically, visualization has helped simulation scientists to understand complex simulation results. As these simulations become even more complex, integrating several different physical domains, visualization will be critical to digest the massive amount of information. Another important role for visualization is to provide a common communication medium from which the domain scientists can use to develop, debug, and analyze their work. Multidisciplinary analyses are the next step in simulation technology, not only in computational aerosciences, but in many other areas such as global climate modeling. Visualization researchers must understand and work towards the challenges posed by multidisciplinary simulation scenarios. This paper addresses some of these challenges, describing technologies that must be investigated to create a useful visualization analysis tool for domain scientists.
Author
Computerized Simulation; Multidisciplinary Research; Aerospace Sciences; Scientific Visualization

20020027528 NASA Ames Research Center, Moffett Field, CA USA
Numerical Solution of Multi-Dimensional Hyperbolic Conservation Laws on Unstructured Meshes
Barth, Timothy J., NASA Ames Research Center, USA; [1995]; 1p; In English; 1st European Numerical Mathematics Conference and Minisymposium, 18-22 Sep. 1995, Paris, Zurich, France, Switzerland
Contract(s)/Grant(s): RTOP 505-59-53; No Copyright; Avail: Issuing Activity; Abstract Only

The lecture material will discuss the application of one-dimensional approximate Riemann solutions and high order accurate data reconstruction as building blocks for solving multi-dimensional hyperbolic equations. This building block procedure is well-documented in the nationally available literature. The relevant stability and convergence theory using positive operator analysis will also be presented. All participants in the minisymposium will be asked to solve one or more generic test problems so that a critical comparison of accuracy can be made among differing approaches.
Author
Hyperbolic Differential Equations; Approximation; Unstructured Grids (Mathematics)

20020027536 NASA Glenn Research Center, Cleveland, OH USA

A Comparison of Three-Dimensional Simulations of Traveling-Wave Tube Cold-Test Characteristics Using CST MICROWAVE STUDIO and MAFIA

Chevalier, C. T., Analex Corp., USA; Herrmann, K. A., NASA Glenn Research Center, USA; Kory, C. L., Analex Corp., USA; Wilson, J. D., NASA Glenn Research Center, USA; Cross, A. W., NASA Glenn Research Center, USA; [2001]; 2p; In English; IEEE International Vacuum Electronics Conference, 23-25 Apr. 2002, Monterey, CA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): NAS3-00145; RTOP 755-1B-00; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Previously, it was shown that MAFIA (solutions of Maxwell's equations by the Finite Integration Algorithm), a three-dimensional simulation code, can be used to produce accurate cold-test characteristics including frequency-phase dispersion, interaction impedance, and attenuation for traveling-wave tube (TWT) slow-wave structures. In an effort to improve user-friendliness and simulation time, a model was developed to compute the cold-test parameters using the electromagnetic field simulation software package CST MICROWAVE STUDIO (MWS). Cold-test parameters were calculated for several slow-wave circuits including a ferruled coupled-cavity, a folded waveguide, and a novel finned-ladder circuit using both MWS and MAFIA. Comparisons indicate that MWS provides more accurate cold-test data with significantly reduced simulation times. Both MAFIA and MWS are based on the finite integration (FI) method; however, MWS has several advantages over MAFIA. First, it has a Windows based interface for PC operation, making it very user-friendly, whereas MAFIA is UNIX based. MWS uses a new Perfect Boundary Approximation (PBA), which increases the accuracy of the simulations by avoiding stair step approximations associated with MAFIA's representation of structures. Finally, MWS includes a Visual Basic for Applications (VBA) compatible macro language that enables the simulation process to be automated and allows for the optimization of user-defined goal functions, such as interaction impedance.

Derived from text

Computerized Simulation; Three Dimensional Models; Applications Programs (Computers); Traveling Wave Tubes; Microwave Frequencies

20020027681 Minnesota Univ., Dept. of Electrical and Computer Engineering, Minneapolis, MN USA

Low-Power VLSI Architectures for Error Control Coding and Wavelets ***Final Report***

Parhi, Keshab K.; Oct. 12, 2001; 9p; In English

Report No.(s): AD-A398592; ARO-37239.16-CI; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This final report provides a brief summary of our research results supported by the above grant during the period from May 1,1998 to November 30, 2001. Our research has addressed design of high-speed, low-energy, low-area architectures for signal processing systems and error control coders. Contributions in the area of error control coding architectures include design of low-energy and low-complexity finite field arithmetic architectures and Reed-Solomon (RS) codecs. High- performance and low-power architectures for low-density parity-check (LDPC) codes have been developed.

DTIC

Very Large Scale Integration; Design Analysis; High Speed; Signal Processing; Architecture (Computers)

20020027707 Center for Mathematics and Computer Science, Dept. of Software Engineering, Amsterdam, Netherlands

Equilibrium Selection in Alternating-Offers Bargaining Models. The Evolutionary Computing Approach: Software Engineering

vanBragt, D. D.; Gerding, E. H.; LaPoutre, J. A.; May 2000; 32p; In English

Report No.(s): PB2002-102032; SEN-R0013; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

A systematic validation of evolutionary techniques in the field of bargaining is presented. For this purpose, the dynamic and equilibrium-selecting behavior of a multi-agent system consisting of adaptive bargaining agents is investigated. The agents' bargaining strategies are updated by an evolutionary algorithm (EA), an innovative computational method to simulate collective learning in societies of boundedly-rational agents. Negotiations between the agents are governed by the well-known 'alternating-offers' protocol. Using this protocol, the influence of various important factors (like the finite length of the game, time preferences, exogenous breakdown, and risk aversiveness) is investigated. We show that game theory can be used successfully to interpret the equilibrium-selecting behavior observed in computational experiments with adaptive bargaining agents. Agreement between theory and experiment is especially good when the agents experience an intermediate time pressure. Deviations from classical game theory are, however, observed in several experiments. Violent nonlinear oscillations may for

instance occur in the single-stage ultimatum game. We demonstrate that the specific evolutionary model governing agent selection is an important factor under these conditions.
NTIS
Algorithms; Game Theory; Software Engineering

20020027708 Center for Mathematics and Computer Science, Dept. of Software Engineering, Amsterdam, Netherlands
Towards Automated Verification of SPLICE in (mu)CRL: Software Engineering
Dechering, P. F. G.; vanLangevelde, I. A.; May 2000; 50p; In English
Report No.(s): PB2002-102034; SEN-R0015; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
A considerable fragment of the coordination architecture SPLICE, including ETHERNET, is specified in the process-algebraic language microCRL. This specification is used to generate transition systems for a number of simple SPLICE applications which are verified by model checking using the CAESAR/ALDEBARAN tool set. For these cases the properties of deadlock freeness, soundness, and weak completeness are proven. The primary result reported is a detailed formal model of SPLICE that makes possible automated verification. Nevertheless, model checking applied to a large number of small applications feasible to generate a transition system. Nevertheless, model checking applied to a large number of small applications, or scenarios, can be used to gather evidence for the validity of properties that is more general than testing in that it considers all possible system traces for a given scenario instead of just one trace. For applications with a high degree of non-determinism this can be an interesting advantage.
NTIS
Program Verification (Computers); Software Engineering

20020027891 Naval Postgraduate School, Monterey, CA USA
Innovations in Computer Generated Autonomy at the MOVES Institute
Hiles, John; VanPutte, Michael; Osborne, Brian; Dec. 17, 2001; 41p; In English
Report No.(s): AD-A398259; NPS-MV-02-002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The MOVES (Modeling, Virtual Environments and Simulation) Institute's Computer-Generated Autonomy Group has focused on a research goal of modeling intensely complex and adaptive behavior while at the same time making the behavior far easier to create and control. This research has led to five new techniques for agent construction, which include a social and organization relationship management engine, a composite agent architecture, an agent goal apparatus, a structure for capturing and applying procedural knowledge (tickets), and the ability to bring these technologies to bear at the right time and in the proper context through connectors. The MOVES Institute, located on the campus of the Naval Postgraduate School, specializes in Department of Defense related research and applications, including projects in 3D (three dimensional) visual simulation, networked virtual environments, computer-generated autonomy, human performance engineering, technologies for immersion, evolving operational modeling and defense/entertainment collaboration (http:// movesinstitute.org). This paper provides a high level overview of the technologies developed by the Computer-Generated Autonomy Group including a description of research projects in the area of helicopter test and evaluation program planning, land navigation route planning, modeling the effects of organizational changes on infantry units, integrating autonomous agents into networked virtual environments, generating interactive stories, and modeling computer security.
DTIC
Computerized Simulation; Architecture (Computers); Autonomy

20020028014 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Real Automation In The Field *Final Report*
Munoz, Cesar, Institute for Computer Applications in Science and Engineering, USA; Mayero, Micaela, Institut National de Recherche d'Informatique et d'Automatique, France; December 2001; 14p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2001-211271; NAS 1.26:211271; ICASE-39; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
We provide a package of strategies for automation of non-linear arithmetic in PVS. In particular, we describe a simplification procedure for the field of real numbers and a strategy for cancellation of common terms.
Author
Arithmetic; Real Numbers; Formalism; Nonlinear Programming

20020028931 Sandia National Labs., Albuquerque, NM USA
Source Code Assurance Tool: LDRD *Final Report*
Espinoza, J.; Campbell, P. L.; Nov. 01, 2001; 43p; In English
Report No.(s): DE2001-789518; SAND2001-3091; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The goal of the project was to develop a software application, the Source Code Assurance Tool (SAT), that would assist an analyst, or team of analysts, in the assessment of a system, both software and non-software.
NTIS
Quality Control; Software Development Tools; Applications Programs (Computers); Analyzing

20020029281 Sandia National Labs., Albuquerque, NM USA
Source Code Assurance Tool: An Implementation
Campbell, P. L.; Espinoza, J.; Nov. 01, 2001; 39p; In English
Report No.(s): DE2001-789523; SAND2001-3094; No Copyright; Avail: Department of Energy Information Bridge
We present the tool we built as part of a Laboratory Directed Research and Development (LDRD) project. This tool consists of a commercially-available, graphical editor front-end, combined with a back end 'slicer.' The significance of the tool is that it shows how to slice across system components. This is an advance from slicing across program components.
NTIS
Quality Control; Slicing; Software Development Tools

20020029282 Sandia National Labs., Albuquerque, NM USA
Visual Structure Language
Campbell, P. L.; Espinoza, J.; Nov. 01, 2001; 23p; In English
Report No.(s): DE2001-789522; SAND2001-3093; No Copyright; Avail: Department of Energy Information Bridge
In this paper we describe a new language, Visual Structure Language (VSL), designed to describe the structure of a program and explain its pieces. This new language is built on top of a general-purpose language, such as C. The language consists of three extensions: explanations, nesting, and arcs. Explanations are comments explicitly associated with code segments. These explanations can be nested. and arcs can be inserted between explanations to show data- or control-flow.
NTIS
Programming Languages; Computer Programs

20020029283 Sandia National Labs., Albuquerque, NM USA
Source Code Assurance Tool: Preliminary Functional Description
Craft, R. L.; Espinoza, J.; Campbell, P. L.; Nov. 01, 2001; 59p; In English
Report No.(s): DE2001-789519; SAND2001-3092; No Copyright; Avail: Department of Energy Information Bridge
It has been said that information system security is really information system security-the point being that in the assessment of an information system, it is never enough to focus only on the bits and bytes that flow through the system. Processes external to the information system, human machine interactions, the information system's operating location, the lifecycle of its components, and a range of other concerns must all be addressed in order to assure that a system that incorporates information technology be safe, secure, and reliable.
NTIS
Quality Control; Position (Location); Information Systems

20020029288 Sandia National Labs., Albuquerque, NM USA
ACME: Algorithms for Contact in a Multiphysics Environment API, 1.0
Brown, K. H.; Summers, R. M.; Glass, M. W.; Gullerud, A. S.; Heinstein, M. W.; Oct. 01, 2001; 88p; In English
Report No.(s): DE2001-789572; SAND2001-3318; No Copyright; Avail: Department of Energy Information Bridge
This document describes the Application Programming Interface (API) for the ACME search and transient dynamics enforcement library. (In an attempt to avoid confusion, capitalized terms are used in this document to refer to specific terminology for which detailed definitions are used in this document to refer to specific terminology for which detailed definitions are provided. A glossary of these terms is given in Appendix A.) This introductory section gives an overview of the concepts and design of the ACME interface and outlines the building blocks that make up the data ACME needs from the host code and the data it returns to the host code. Section 2 describes various utility functions used to extract information about the package and its operation. Section 3 describes the functions needed to access and utilize the search capabilities of ACME. Section 4 describes functions that can be used to remove an initial overlap for a mesh prior to beginning a transient. Section 5 describes the functions provided by

ACME to enforce the results of the search to explicit transient dynamics. Finally, Section 6 provides an example of how to use the API within a C++ application.
NTIS
Algorithms; Interactions; C++ (Programming Language); Extraction

20020029433 Research and Technology Organization, Systems Concepts and Integration Panel, Neuilly-sur-Seine, France
Tactical Decision Aids and Situational Awareness ***Les Aides a la Prise de Decisions Tactiques et la Connaissance de la Situation des Forces***
January 2002; 96p; In English; Tactical Decision Aids and Situational Awareness, 1-2 Nov. 2001, Amsterdam, Sofia, Madrid, MD, Netherlands, Bulgaria, Spain, USA; Also announced as 20020029434 through 20020029439; CD-ROM contains full text document in PDF format
Report No.(s): RTO-EN-019; AC/323(SCI-113)TP/41; ISBN 92-837-1080-0; Copyright Waived; Avail: CASI; C01, CD-ROM; A05, Hardcopy; A01, Microfiche

Today, the use of decision aids systems for commander and operators in the battlefield area is playing an important role due to the new frequent situation of joint coalition and asymmetric warfare in which the defense forces are involved. On these occasions, the capability of own forces to have the evolution of the tactical situation in real time is extremely important. Since combat survival and mission accomplishment depend upon operators performance in the process of decision-making, and the operator performance depends upon the degree of awareness, situation awareness can be seen as a result of a continuous assessment of situation parameters by the operators. This mission critical chain of sub-segment functions is greatly influenced by the nature of the technical systems the operator is leading with.
Author
Situational Awareness; Decision Support Systems; Decision Making

20020029724 Defense Logistics Agency, Operations Research and Economic Analysis Management Support Office, Fort Belvoir, VA USA
Automating Information Extraction From 3D Body Scan Data ***Final Report, 6 Aug. 1996-30 Apr. 1999***
Beecher, Robert M.; Nov. 24, 1999; 53p; In English
Contract(s)/Grant(s): SPO100-95-D-1011
Report No.(s): AD-A398339; ARN-001; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This project had the objective of developing computer software to extract information from 3D human body laser scan surface data that is useful for military uniform sizing. Beeches Research (BRC) worked with a consortium of five other organizations in this project for the Apparel Research Network (ARN). BRC contributed to algorithm and source code development for computer program functions which measure Stature, Cross-Shoulder Length, Sleeve Length, Pant Inseam, and circumferences of the Neck, Chest, Waist, and Seat. to gather data for testing, BRC was involved in laser surface scanning of subjects at the US army Natick (MA) RD&E Center, and the US Marine Corps Recruit Depot, San Diego. BRC evaluated the results of successive versions of the computer program ARNscan using comparable traditional measurements of the subjects and computer graphics displays of the measurements generated by ARNscan. Except for Sleeve Length, ARNscan functions producing consistent results were developed.
DTIC
Computer Programs; Scanning; Image Processing; Information Retrieval; Optical Data Processing; Anthropometry; Body Size (Biology)

20020029861 Center for Mathematics and Computer Science, Dept. of Software Engineering, Amsterdam, Netherlands
Compiling Language Definitions: The ASF+SDF Compiler
vandenBrand, M. G. J.; Heering, J.; Klint, P.; Oliver, P. A.; May 2000; 48p; In English
Report No.(s): PB2002-102033; SEN-R0014; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The ASF+SDF Meta-Environment is an interactive language development environment whose main application areas are definition of domain-specific languages, generation of program analysis and transformation tools, production of software renovation tools, and general specification and prototyping. It uses conditional rewrite rules to define the dynamic semantics and other tool-oriented aspects of languages, so the effectiveness of the generated tools is critically dependent on the quality of the rewrite rule implementation. The ASF+SDF rewrite rule compiler generates C code, thus taking advantage of C's portability and the sophisticated optimization capabilities of current C compilers as well as avoiding potential abstract machine interface bottlenecks. It can handle large (10,000+ rule) language definitions and uses an efficient run-time storage scheme capable of handling large (1,000,00+ node) terms. Term storage uses maximal subterm sharing (hash-consing), which turns out to be more

effective in the case of ASF+SDF than in Lisp or SML. Extensive benchmarking has shown the time and space performance of the generated code to be as good as or better than that of the best current rewrite rule and functional language compilers.
NTIS
Programming Languages; Lisp (Programming Language); Compilers

20020029908 Naval Postgraduate School, Monterey, CA USA
Software Testing Tools: Metrics for Measurement of Effectiveness on Procedural and Object-Oriented Source Code
Bossuyt, Bernard J., Naval Postgraduate School, USA; Snyder, Byron B., Naval Postgraduate School, USA; Sep. 2001; 209p; In English; Original contains color images
Report No.(s): AD-A397128; No Copyright; Avail: Defense Technical Information Center (DTIC)
The levels of quality, maintainability, testability, and stability of software can be improved and measured through the use of automated testing tools throughout the software development process. Automated testing tools assist software engineers to gauge the quality of software by automating the mechanical aspects of the software-testing task. Automated testing tools vary in their underlying approach, quality, and ease-of-use, among other characteristics. Evaluating available tools and selecting the most appropriate suite of tools can be a difficult and time-consuming process. In this thesis, we propose a suite of objective metrics for measuring tool characteristics, as an aid in systematically evaluating and selecting automated testing tools. Future work includes further research into the validity and utility of this suite of metrics, conducting similar research using a larger software project, and incorporating a larger set of tools into similar research.
DTIC
Software Engineering; Software Development Tools; Program Verification (Computers)

20020030128 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Towards Modelling and Verification of Concurrent Ada Programs Using Petri Nets
Burns, A.; Wellings, A. J.; Burns, F.; Koelmans, A. M.; Koutny, M.; Jul. 2001; 29p; In English
Report No.(s): PB2002-102571; CS-TR-700; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Ada 95 is an expressive concurrent programming language with which it is possible to build complex multi-tasking application. Much of the complexity of these applications stems from the interactions between the tasks. This paper argues that Petri nets offer a promising, tool-supported, technique for checking the logical correctness of the tasking algorithms. The paper illustrates effectiveness of this approach by showing the correctness of an Ada implementation of the atomic action protocol using a variety of Petri net tools, including PED, PEP and INA for P/T nets and Design/CPN for Coloured Petri nets.
NTIS
Petri Nets; Ada (Programming Language); Protocol (Computers); Atoms

20020030194 Center for Mathematics and Computer Science, Amsterdam Netherlands
Theorem Proving and Programming with Dynamic First Order Logic
van Eijck, D. J. N.; Heguiabehere, J. M.; Nuallain, B. O.; Oct. 31, 2000; 46p; In English
Report No.(s): PB2002-103661; INS-R0020; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Dynamic First Order Logic results from interpreting quantification over a variable (v) as change of valuation over the v position, cojunction as sequential composition, disjunction as nondeterministic choice, and negation as (negated) test for continuation. We present a tableau style calculus for DFOL with explicit (simultaneous) substitution, prove its soundness and completeness, and point out its relevance for programming with dynamic first order logic, for automatic program analysis, and for semantics of natural language. Next, we extend this to an infinitary calculus for DFOL with iteration.
NTIS
Theorem Proving; Computer Programming; Selection

20020030195 Center for Mathematics and Computer Science, Amsterdam Netherlands
Proper Treatment of Context in NL (Natural Language)
van Eijck, D. J. N.; Sep. 30, 2000; 22p; In English
Report No.(s): PB2002-103659; INS-R0018; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The proper treatment of quantification in Natural Language proposed by Richard Montague some thirty years ago does not do proper justice to the fact that interpretation of texts both uses context and sets up new contexts. The dynamic turn in NL semantics is the attempt to model this basic fact, but the use of dynamically quantified variables introduces an undesirable element into this attempt. by extending a variable free 'incremental dynamics' with a flexible system of type scheme patterns and type

scheme pattern matching, we arrive at a Montague style architecture for NL semantics that provides a proper treatment both of quantification and of context use and context change.
NTIS
Natural Language (Computers); Pattern Recognition; Texts

20020030202 Center for Mathematics and Computer Science, Amsterdam Netherlands
XML Benchmark Project. Information Systems
Schmidt, A. R.; Waas, F.; Kersten, M. L.; Florescu, D.; Manolescu, I.; Apr. 30, 2001; 24p; In English
Report No.(s): PB2002-103669; INS-R0103; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
With standardization efforts of query language for XML documents drawing to a close, researchers and users increasingly focus their attention on the database technology that has to deliver on the new challenges that sheer amount of XML documents produced by applications pose to data management: validation, performance evaluation and optimization of XML query processors are the upcoming issues. Following a long tradition in database research, the XML Store Benchmark Project provides a framework to assess an XML database's abilities to cope with a broad spectrum of different queries, typically posed in real-world application scenarios. The benchmark is intended to help both implementors and users to compare XML databases independent of their own, specific application scenario. To this end, the benchmark offers a set queries each of which is intended to challenge a particular primitive of the query processor or storage engine.
NTIS
Data Bases; Evaluation; Information Systems; Performance Tests; Range (Extremes)

20020030250 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Rewriting Logic and Elan: Prototyping Tools for Petri Nets with Time
Steggles, L. J.; Apr. 2001; 22p; In English
Report No.(s): PB2002-102557; CS-TR-716; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Rewriting logic (RL) is an extension of standard algebraic specification techniques which use rewrite rules to model the dynamic behaviour of a system. In this paper we consider using RL and an associated support tool Elan as an environment for rapidly prototyping and analysing Petri nets with time. We link these algebraic tools to PEP, an existing Petri net tool which provides a user-friendly front end to our framework. Our flexible approach allows the wide range of possible time extensions presented in the literature to be investigated and thus overcomes one of the major drawbacks of the current hardwired tools. We demonstrate our ideas by considering time Petri nets in which transitions are associated with a firing interval. The flexibility of our approach is illustrated by modelling a range of semantic alternatives for time Petri nets taken from the literature.
NTIS
Algebra; Dynamic Characteristics; Petri Nets

20020030251 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Supporting Evaluation of Interface Exceptions
Mikhailova, A.; Romanovsky, A.; Apr. 2001; 24p; In English
Report No.(s): PB2002-102556; CS-TR-715; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Interface exceptions (explicitly declared exceptions that a method can propagate outside) are an inherent part of the interface describing the behaviour of a particular class of objects. Evolution of system behaviour is thus necessarily accompanied by and reflected in the evolution of interface exceptions. While evolution of normal system behaviour is adequately supported by various language mechanisms, such as subtyping and inheritance, few contemporary object-oriented programming languages offer support for adding exceptions while subtyping, but none of them provides an adequate support for adding exceptions. In this paper we propose two complementary solutions for dealing with additional exceptions introduced while system evolution. to solve the problem of non-conforming interfaces resulting from the addition of new exceptions in a development step, the first proposal uses rescue handlers and the second one employs the forwarding technique.
NTIS
Interfaces; Object-Oriented Programming

20020030252 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Comparative Study of Exception Handling Mechanisms for Building Dependable Object-Oriented Software
Garcia, A. F.; Rubira, C.; Romanovsky, A.; Xu, J.; Apr. 2001; 57p; In English
Report No.(s): PB2002-102555; CS-TR-714; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Modern object-oriented systems have to cope with an increasing number of exceptional and incorporate fault tolerance activities in order to meet the system's dependability requirements. With such systems growing in size and complexity, employing error-handling techniques while satisfying the requirements of software quality, such as maintainability and reusability, are still deep concerns to engineers of dependable object-oriented systems. An exception handling mechanism is one of the most important schemes for detecting and recovering errors, and structuring the fault tolerance activities incorporated in a system. However, the current lack of suitable exception handling mechanisms can make an application non-reliable and difficult to understand, maintain and reuse in the presence of faults. The purpose of our paper is to investigate the applicability of the existing exception mechanisms of object-oriented programming languages for developing dependable object-oriented software with effective quality attributes.
NTIS
Object-Oriented Programming; Software Engineering; Computer Programs; Error Analysis

20020030253 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Using Reflection as a Mechanism for Enforcing Security Policies in Mobile Code
Welch, I.; Stroud, R. J.; Jul. 2001; 24p; In English
Report No.(s): PB2002-102570; CS-TR-705; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Several authors have proposed using code modification as a technique for enforcing security policies such as resource limits, access controls, and network information flows. However, these approaches are typically ad hoc and are implemented without a high level abstract framework based on the semantics of the underlying programming language. We have developed a reflective version of Java called Kava that uses byte-code rewriting techniques to insert pre-defined books into Java class files at load time. This makes it possible to specify and implement security policies for mobile code in a more abstract and flexible way. Our mechanism could be used as a more principled way of enforcing some of the existing security policies described in the literature. The advantages of our approach over related work (SASI, J-Res, etc.) are that we can guarantee that our security mechanisms cannot be bypassed, a property we call strong, non-bypassability, and that our approach provides the high level abstractions needed to build useful security policies.
NTIS
Reflection; Security; Network Analysis; Access Control

20020030254 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Developing and Verifying Design Abstractions for Reliable Concurrent Programming in Ada
Burns, A.; Wellings, A. J.; Koelmans, A. M.; Koutny, M.; Romanovsky, A.; Jul. 2001; 47p; In English
Report No.(s): PB2002-102569; CS-TR-706; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
Ada 95 is an expressive concurrent programming language with which it is possible to build complex multi-tasking applications. Much of the complexity of these applications stems from the interactions between the tasks. This paper argues that Petri nets offer a promising, tool-supported, technique for checking the logical correctness of the tasking algorithms. The paper illustrates the effectiveness of this approach by showing the correctness of an Ada implementation of the atomic action protocol using a variety of Petri net tools, including PED, PEP, and INA for P/T nets and Design/CPN for Coloured Petri nets.
NTIS
Ada (Programming Language); Petri Nets; Algorithms

20020030255 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Action-Oriented Exception Handling in Cooperative and Competitive Concurrent Object-Oriented Systems
Romanovsky, A.; Kienzle, J.; Apr. 2001; 39p; In English
Report No.(s): PB2002-102568; CS-TR-713; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The chief aim of this survey is to discuss exception handling models which have been developed for concurrent object systems. In conducting this discussion we rely on the following fundamental principles: exception handling should be associated with structuring techniques; concurrent systems require exception handling which is different from that used in sequential systems; concurrent systems are best structured out of (nested) actions; atomicity of action is crucial for developing complex systems. In this survey we adhere to the well-known classification of concurrent systems, developed in the 70s by C.A.R. Hoare, J.J. Horning and B. Randell, into cooperative, competitive and disjoint ones. Competitive systems are structured using atomic transactions. Atomic actions are used for structuring cooperative systems. Complex systems in which components can compete and cooperate are structured using Coordinated Atomic actions. The focus of the survey is on outlining models and schemes which

combine these action-based structuring approaches with exception handling. In conclusion we emphasise that exception handling model should be adequate to the system development paradigm and structuring approaches used.
NTIS
Object-Oriented Programming; Atoms; Complex Systems; Classifications; Systems Engineering

20020030256 Center for Mathematics and Computer Science, Amsterdam Netherlands
Integrating Multimedia Characteristics in Web-Based Document Languages
van Ossenbruggen, J. R.; Hardman, H. L.; Rutledge, L. W.; Dec. 31, 2000; 22p; In English
Report No.(s): PB2002-103665; INS-R0024; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
A single multimedia document model needs to include a wide range of different types of information. In particular, information about space and time is essential for determining the spatial and temporal placement of elements within a presentation. Each information type included in a document model requires its own structuring mechanisms. The language used to express the document model has to be able to encapsulate the plurality of required structures. While this is a process that can be carried out relatively easily during the initial design of a language, it is more difficult in the case that a particular document language already exists and extra multimedia characteristics are required. For example, one could consider adding temporal information to an existing 'static' document language. We investigate the underlying problems of superimposing a new document feature on an existing language and discuss possible strategies for integrating the required extra information in a modified document description language.
NTIS
Multimedia; World Wide Web; Programming Languages

20020030259 Naval Postgraduate School, Monterey, CA USA
Scenario Authoring and Visualization for Advanced Graphical Environments (SAVAGE)
Nicklaus, Shane D.; Sep. 2001; 264p; In English
Report No.(s): AD-A397454; No Copyright; Avail: Defense Technical Information Center (DTIC)
Today's planning and modeling systems use two-dimensional (2D) representations of the three-dimensional (3D) battlespace. This presents a challenge for planners, commanders, and troops to understand the true nature of the battlespace. This thesis shows how 3D visualization can give both operation planners and executors a better understanding of the battlespace that can augment today's 2D systems. Automatic creation of a 3D model for an amphibious operation allows the planner to view an operation order as a whole, from different perspectives. Recommended changes can be made and their effects immediately known. Warfighters can use the same tools for mission preparation and review. The USA and NATO (North Atlantic Treaty Organization) nations use the Land C2 Information Exchange Data Model (LC2IEDM), formally known as the Generic Hub, as a common method for exchanging data between independent systems. As part of the Scenario Authoring and Visualization for Advanced Graphical Environments (SAVAGE) project, this research presents an integrated Web access and 3D visualization strategy for Department of Defense (DOD) tactical messaging and operation orders using the Generic Hub data model and the Extensible Markup Language (XML). A number of alternative yet consistent ways to represent an amphibious operation scenario demonstrate the power, flexibility and scalability of the SAVAGE approach.
DTIC
Computer Programs; Military Operations; Graphical User Interface; Military Technology; Management Planning

20020030263 Naval Postgraduate School, Monterey, CA USA
Application Programmer's Interface (API) for Heterogeneous Language Environment and Upgrading the Legacy Embedded Software
Moua, Theng C.; Sep. 2001; 116p; In English; Original contains color images
Report No.(s): AD-A397557; No Copyright; Avail: Defense Technical Information Center (DTIC)
Legacy software systems in the Department of Defense (DoD) have been evolving and are becoming increasingly complex and are becoming increasingly complex while providing more functionality. The shortage of original software designs, lack of corporate knowledge and software design documentation, unsupported programming languages, and obsolete real-time operating system and development tools have become critical issues for the acquisition community. Consequently, these systems are now very costly to maintain and upgrade in order to meet current and future functional and nonfunctional requirements. This thesis proposes a new interoperability model for re-engineering of old procedural software of the Multifunctional Information Distributed System Low Volume Terminal (MIDS-LVT) to a modern object-oriented architecture. In the MIDS-LVT modernization acquisition strategy, only one Computer Software Configuration Item (CSCI) component at a time will be redesigned into an object-oriented program while interoperability with other unmodified CSCIs in the MIDS-LVT distributed

environment must be maintained. Using this model, each legacy CSCI component can be redesigned independently without affecting the others.
DTIC
Computer Programs; Information Systems; Interoperability; Software Engineering; Data Links

20020030265 Naval Postgraduate School, Monterey, CA USA
Web Database Development
Tsardas, Nikolaos A.; Sep. 2001; 91p; In English; Original contains color images
Report No.(s): AD-A397539; No Copyright; Avail: Defense Technical Information Center (DTIC)
This thesis explores the concept of Web Database Development using Active Server Pages (ASP) and Java Server Pages (JSP). These are among the leading technologies in the web database development. The focus of this thesis was to analyze and compare the ASP and JSP technologies, exposing their capabilities, limitations, and differences between them. Specifically, issues related to back-end connectivity using Open Database Connectivity (ODBC) and Java Database Connectivity (JDBC), application architecture, performance, and web security were examined. For demonstration purposes, two applications were developed, one with ASP and another with JSP. The user interface and the functionality of these two applications were identical, while the architecture, performance, and back-end connectivity was totally different.
DTIC
Applications Programs (Computers); Client Server Systems; Data Bases; Architecture (Computers)

20020030266 Naval Postgraduate School, Monterey, CA USA
A Pattern-Matching Approach for Automated Scenario-Driven Testing of Structured Computational Policy
Sezgin, Mehmet; Sep. 2001; 159p; In English
Report No.(s): AD-A397521; No Copyright; Avail: Defense Technical Information Center (DTIC)
Organizations are policy-driven entities. Policy bases can be very large and complex; these factors are in the dynamic nature of policy evolution. The mechanical aspects of policy modification and assurance of the consistency, completeness, and correctness of a policy base can be automated to some degree. Such support is known as computer support for policy. We developed an object-oriented schema-based approach to structure policy. Our structural model consists of Unified Modeling Language class and collaboration diagrams. The structural model is used by a suite of testing tools. We present a case study to illustrate our approach to automated testing of policy., Our approach to test-case generation is based on the use of patterns within policy statements and relationships between policy objects. The test spectrum has query-specific tests at one end, and the generic types of tests at the other end. We introduce the use of statistical inference to reuse test cases by determining the patterns that approximate the query-to-be-executed. Query mapping, anytime reasoning and fuzzy logic concepts in policies and their applications are discussed.
DTIC
Models; Object-Oriented Programming; Policies; Software Engineering

20020030274 Naval Postgraduate School, Monterey, CA USA
Dynamic Scalable Network Area of Interest Management for Virtual Worlds
Wathen, Michael S.; Sep. 2001; 72p; In English
Report No.(s): AD-A397603; No Copyright; Avail: Defense Technical Information Center (DTIC)
A major performance challenge in developing a massively multi-user virtual world is network scalability. This is because the network over which entities communicate can quickly develop into a bottleneck. Three critical factors: bandwidth usage, packets per second, and network-related CPU usage, should be governed by the number of entities a given user is interested in, not the total number of entities in the world. The challenge then is to allow a virtual world to scale to any size without an appreciable drop in system performance. to address these concerns, this thesis describes a novel Area of Interest Manager (AOIM) built atop the NPSNET-V virtual environment system. It is a dynamically sized, geographical region based, sender-side interest manager that supports dynamic entity discovery and peer-to-peer entity communication. The AOIM also makes use of tools provided by the NPSNET-V system, such as variable resolution protocols and variable data transmission rate. Performance tests have shown conclusively that these interest management techniques are able to produce dramatic savings in network bandwidth usage in a peer-to-peer virtual environment. In one test, this AOIM produced a 92% drop in network traffic, with a simultaneous 500% increase in world population.
DTIC
Virtual Reality; Computerized Simulation; Computer Networks; Protocol (Computers)

20020030276 Naval Postgraduate School, Monterey, CA USA

Reducing Non-Monotonicities In Combat Models

Vinyard, William C.; Sep. 2001; 139p; In English; Original contains color images

Report No.(s): AD-A397601; No Copyright; Avail: Defense Technical Information Center (DTIC)

Non-monotonic behavior in combat models is an important topic to those using the output of such models as a basis for decision making. These decisions can be complicated by non-monotonic behavior in the combat models. This paper examines the Dewar model which exhibits non-monotonic behavior caused by the chaos inherent in its structure. Previous papers have examined only small subsets of this 18 dimensional combat model. The combinatorial possibilities of main effects and interactions among the 18 dimensions are too great to examine en masse. Consequently, we have three goals: First, systematically explore the Dewar model for additional non-monotonic behavior; Second, determine the effect of stochastic modeling on the non-monotonic behavior of the Dewar model response surface; and Third, we develop a method for measuring non-monotonicity in the response surface generated by the model Latin Hypercube Sampling, discovers non-monotonicity across broad regions of the model's phase space, and in multiple measures of effectiveness. Stochastic perturbation of model parameters has a dramatic effect on the non-monotonicity of the response surface. Stochastic perturbation can both reduce and exacerbate the non-monotonic behavior of the response surface. If done properly, stochastic modeling can significantly improve the interpretability of the response surface.

DTIC

Combat; Mathematical Models; Monotone Functions; Stochastic Processes

20020030298 Arcon Corp., Waltham, MA USA

Installation and Operation of Particle Transport Simulation Programs to Model the Detection and Measurement of Space Radiation of Space-Borne Sensors ***Interim Report, 10 Aug. 1999 - 31 Jul. 2000***

Woolf, Stanley, Arcon Corp., USA; Dec. 29, 1999; 85p; In English

Contract(s)/Grant(s): F19628-99-C-0077; AF Proj. 2822

Report No.(s): AD-A398366; AFRL-VS-TR-2001-1605; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This document is a report of the technical progress made during the period 10 Aug. 1999 - 31 July 2000 in the areas of: (1) research and evaluation of particle transport simulation programs for modeling the detection and measurement of space radiation by space-borne sensors; (2) construction of realistic flight sensor computer models; (3) performance of particle transport calculations; (4) analysis of transport simulation results, including single particle tracking; (5) transfer and facilitation in the implementation of particle transport simulation technology to AFRL. Several computer programs (LAHET, ACCEPT, CYLTRAN, MCNPX) for particle transport simulation were applied to the modeling of the CEASE and HEP sensors. In addition, a preliminary version of a post-processor program for analysis of single particle histories from MCNPX was written. Shown in this report are several listings of input files, with geometry/materials drawings, for the various simulation programs, an example of (excerpt from) a track file analysis, and partial listings of code outputs.

DTIC

Computer Programs; Computerized Simulation; Systems Simulation; Radiation Measurement

20020030736 Department of Defense, Environmental Data Quality Workgroup, Washington, DC USA

Department of Defense Quality Systems Manual for Environmental Laboratories - Version 1 Final Based on NELAP Voted Revision 12 - 1 July 1999 ***Final Report***

Oct. 2000; 86p; In English; Original contains color images

Report No.(s): AD-A397396; No Copyright; Avail: Defense Technical Information Center (DTIC)

The purpose of this document is to provide implementation guidance on the establishment and management of quality systems for environmental testing laboratories that intend to perform work for DoD (Department of Defense). This guidance is based on the National Environmental Laboratory Accreditation Conference's (NELAC) Quality System requirements and provided implementation clarification and expectations for DoD environmental programs. It is designed to serve as a standard reference for DoD representatives from all components who design, implement, and oversee contracts with environmental testing laboratories.

DTIC

Laboratories; Quality Control; Standards; Environmental Tests

20020030822 Eoetvoes LORANd Univ., Budapest Hungary

Structure Based Identification of XML Documents ***Final Report***

Lorincz, Andras; Sep. 21, 2001; 134p; In English; Original contains color images

Contract(s)/Grant(s): F61775-00-W-E065

Report No.(s): AD-A398186; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report results from a contract tasking Pazmany-Eotvos Foundation of Natural Sciences and Informatics as follows: The contractor shall have the following topics investigated under the supervision of Professor Andras Lorincz. Application of the eXtensible Markup Language (XML) to building large-scale information resources out of millions of interrelated documents will be investigated. Potential advantages of XML for improvement of document processing by separating presentation from content and by revealing semantic structure of the documents will be exploited.

DTIC

Indexing (Information Science); Internet Resources

20020030823 Wright State Univ., Brehm Lab., Dayton, OH USA

Models, Web-Based Simulations, and Integrated Analysis Techniques for Improved Logistical Performance

Hill, Raymond R., Jr.; Narayanan, S.; Mykytka, Edward F.; Nov. 2001; 54p; In English; Original contains color images; Prepared in collaboration with Wright State Univ., and Univ. of Dayton, Dayton, OH

Report No.(s): AD-A398183; AFIT/EN-TR-01-02; No Copyright; Avail: Defense Technical Information Center (DTIC)

In February 1999, a team of researchers from the Air Force Institute of Technology, the Wright State University and the University of Dayton teamed with researchers within the Air Force Research Laboratory, Logistics Research Division, Logistics Readiness Branch to propose a research agenda entitled, ”Models, Web-based Simulations, and Integrated Analysis Techniques for Improved Logistical Performance.” This proposal was submitted in response to the initial Dayton Area Graduate Studies Institute request for proposals under the Joint Air Force Research Laboratory/DAGSI Basic Research Program. The particular project supported as HE15 within the Human Effectiveness Directorate and entitled Logistics Readiness. The proposal successfully competed and was selected for contract award. Between June 1999 and July 2001, the researchers from the collaborating institutes pursued a collective research agenda, one that was closely aligned with the missions of the AFRL Logistics Readiness Branch as well as other organizations within the USA Air Force. This final technical report summarizes the research efforts under the contract, AFIT-HE-99-10. This report includes descriptions of the accomplishments of the research as well as listings of the numerous papers produced, presentations made, and masters thesis completed directly supporting, and supported by this research effort.

DTIC

Computerized Simulation; Logistics Management; Logistics

20020031243 NASA Glenn Research Center, Cleveland, OH USA

Networks for Autonomous Formation Flying Satellite Systems

Knoblock, Eric J., Cleveland State Univ., USA; Konangi, Vijay K., Cleveland State Univ., USA; Wallett, Thomas M., NASA Glenn Research Center, USA; Bhasin, Kul B., NASA Glenn Research Center, USA; [2001]; 8p; In English; 19th AIAA International Communications Satellite Systems Conference, 17-20 Apr. 2001, Toulouse, France; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): NCC3-595; RTOP 755-1B-00

Report No.(s): AIAA Paper 2001-0920; Copyright Waived; Avail: CASI; A02, Hardcopy; A01, Microfiche

The performance of three communications networks to support autonomous multi-spacecraft formation flying systems is presented. All systems are comprised of a ten-satellite formation arranged in a star topology, with one of the satellites designated as the central or ”mother ship.” All data is routed through the mother ship to the terrestrial network. The first system uses a TCP/lP over ATM protocol architecture within the formation the second system uses the IEEE 802.11 protocol architecture within the formation and the last system uses both of the previous architectures with a constellation of geosynchronous satellites serving as an intermediate point-of-contact between the formation and the terrestrial network. The simulations consist of file transfers using either the File Transfer Protocol (FTP) or the Simple Automatic File Exchange (SAFE) Protocol. The results compare the IF queuing delay, and IP processing delay at the mother ship as well as application-level round-trip time for both systems, In all cases, using IEEE 802.11 within the formation yields less delay. Also, the throughput exhibited by SAFE is better than FTP.

Author

Communication Networks; Satellite Communication; Protocol (Computers); Formation Flying

20020031752 Air Command and Staff Coll., Maxwell AFB, AL USA

The Need for Internet Censorship at the Air Command and Staff College

Richie, Glenn S.; Apr. 1998; 57p; In English; Original contains color images

Report No.(s): AD-A398693; AU/ACSC/234/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this project, the researcher attempted to determine if ACSC (Air Command and Staff College) should censor Internet access for its students. The methodology for conducting this research was 50 randomly distributed surveys. The results of these surveys were evaluated using frequencies to determine the level of responses for each question. At the completion of the statistical analysis, the researcher interpreted the descriptions of each question independently. Finally, the researcher selected six descriptors that were significant in refuting the research question. From the study, the researcher was able to determine that 83% of the population uses the Internet somewhere between five and eleven times per week. Within that population, 51% of the individuals at the ACSC used the Internet daily for less than two hours for non-work related purposes. The other forty-nine percent (49%) of the population never uses the Internet while physically located at the ACSC for non-work related purposes. Finally, only three respondents indicated they had used the Internet inappropriately based on the ACSC policy. Based upon the key findings, the answer to the researcher's question, posed above, is no. There is no need for censorship of the Internet at the ACSC. It has been demonstrated that through effective written and verbal communications, the ACSC has curtailed inappropriate Internet utilization, not from using tools that monitor or censor Internet utilization.

DTIC

Internets; Personnel Management; Human Resources

20020032226 Stanford Univ., Dept. of Computer Science, Stanford, CA USA

Abstraction and Compositionality for the Verification of Infinite-State Reactive Systems ***Final Report, 1 Aug. 1998-31 Jul. 2001***

Manna, Zohar; Sipma, Henny; Jul. 2001; 10p; In English

Contract(s)/Grant(s): DAAG55-98-1-0471

Report No.(s): AD-A398862; ARO-38760.1-CI; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We describe several techniques for verifying infinite-state systems via finite-state abstractions. Diagrams are top-down property-driven abstractions, which are especially suited for compositional, assume-guarantee reasoning. Predicate abstraction uses a bottom-up approach for generating abstractions; invariant generation techniques are applied to automatically generate the required predicates. Extended finite-state abstractions allow inclusion of extra information produced by the deductive abstraction, which can be used by the model checker to reduce the number of spurious counter-examples. These methods have been or currently are being implemented in the Stanford Temporal Prover. The methods have been applied in the analysis of a medical device.

DTIC

Software Reliability; Program Verification (Computers)

20020032235 Air Command and Staff Coll., Maxwell AFB, AL USA

Open Source and These USA

Seiferth, C. J.; Apr. 1999; 76p; In English

Report No.(s): AD-A398898; AU/ACSC/184/1999-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

Over the past 40 years a collective form of systems development has evolved on the electronic networks of the world. In the wake of the information technology revolution has come a proven method for developing, deploying and maintaining these systems. This method, developed under the auspices of Department of Defense research grants, has resulted in the most successful and reliable software in existence. This method, based on collective intelligence, peer review and functional evolution, has rippled through the world of Information Technology. It depends on the uninhibited distribution of the currency of this realm: the source code, documentation and data which are the building blocks of these complex systems. The release of source code is commonly called open source licensing. The release of electronic information is known as open content licensing. Together, they comprise Open Licensing. There are significant gains to be realized through the formal adoption, support and use of open licensed systems by the Department of Defense. Secondary gains may be made in the morale and retention of Airmen involved in information technology. This adoption can take place at any point in the acquisition cycle and can even benefit deployed and operational systems. The benefits include reduced acquisition, development, maintenance and support costs and increased interoperability among our own systems and those of our Allies.

DTIC

Source Programs; Computer Programming; Licensing; Armed Forces (USA)

20020032238 Lockheed Martin Tactical Aircraft Systems, Fort Worth, TX USA

Simulation Assessment Validation Environment (SAVE) ***Final Report, 1 Apr. 1995-30 Sep. 2000***

Cole, Paul; Bassett, Bob; Herndon, Marcia; Collins, Paul; Jacobson, Kathy; Sep. 2000; 168p; In English; Original contains color images

Contract(s)/Grant(s): F33615-95-C-5538; Proj-2025

Report No.(s): AD-A398989; AFRL-ML-WP-TR-2001-4088; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report presents a programmatic overview of SAVE (Simulation Assessment Validation Environment) and describes the activities of development, demonstration, validation, and planning for implementation and commercialization. This report covers the full period of the SAVE Program, from April 1995 through September 2000. A detailed description of the SAVE software system is documented in the SAVE Software Product End Item Report and information for users of the system is presented in the SAVE Software User's Manual.

DTIC

Computerized Simulation; Fighter Aircraft; Computer Aided Manufacturing

20020032324 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA

OpenGL Performance Evaluation on Multiple Computer Platforms

Ho, Sean; Nov. 2001; 41p; In English; Original contains color images

Report No.(s): AD-A398755; ARL-TR-2374; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the recent advent of 3D graphics hardware for personal computer (PC), it is worthwhile to exploit the cost effectiveness and OpenGL performance issues among currently available commercial off-the-self (COTS) computers. Graphics hardware vendors typically list several gross measurements of system performance when releasing new graphics hardware. Often these coarse or subjective figures do not represent how a software application performs. On the other hand, one seldom sees the same benchmark performed on machines across multiple platforms and operating systems, i.e., Intel-based PCs and RISC-based UNIX workstations. This document reports the results obtained from running two OpenGL benchmark programs, SPECviewperf 6.1.2 and SPECglperf 3.1.2, on existing computer workstations at ARL.

DTIC

Evaluation; Performance Tests; Computer Programs; Commercial Off-The-Shelf Products

20020032328 Naval Surface Warfare Center, Dahlgren, VA USA

DIRAC Networks: An Approach to Probabilistic Inference Based Upon the DIRAC Algebra of Quantum Mechanics ***Final Report***

Parks, A. D.; Herman, M. A.; Jun. 2001; 105p; In English

Report No.(s): AD-A398772; NSWCDD/TR-01/103; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report describes how the Dirac algebra of quantum mechanics provides for a robust and self-consistent approach to probabilistic inference system modeling and processing. We call such systems Dirac networks and demonstrate how their use: (1) allows an efficient algebraic encoding of the probabilities and distributions for all possible combinations of truth values for the logical variable in an inference system; (2) employs unitary-rotation, time evolution, and translation operators to model influences upon system variable probabilities and their distributions; (3) guarantees system normalization; (4) admits unambiguously defined linear, as well as cyclic, cause and effect relationships; (5) enables the use of the von Neumann entropy as an informational uncertainty measure; and (6) allows for a variety of 'measurement' operators useful for quantifying probabilistic inferences. Dirac networks should have utility in such diverse application areas as data fusion and analysis, dynamic resource allocation, qualitative analysis of complex systems, automated medical diagnostics, and interactive/collaborative decision processes. The approach is illustrated by developing and applying simple Dirac networks to the following representative problems: (1) cruise missile-target allocation decision aiding; (2) genetic disease carrier identification using ancestral evidential information; (3) combat system control methodology trade-off analysis; (4) finding rotational symmetries in a digital image; and (5) fusing observational error profiles. Optical device implementations of several Dirac network components are also briefly discussed.

DTIC

Algebra; Complex Systems; Inference; Probability Theory; Quantum Mechanics

20020032685 NASA Ames Research Center, Moffett Field, CA USA

Guidance of Nonlinear Systems

Meyer, George, NASA Ames Research Center, USA; [1996]; 1p; In English; Second World Congress of Nonlinear Analysis, 10-17 Jul. 1996, Athens, Greece

Contract(s)/Grant(s): RTOP 505-64-13; No Copyright; Avail: Issuing Activity; Abstract Only

The paper describes a method for guiding a dynamic system through a given set of points. The paradigm is a fully automatic aircraft subject to air traffic control (ATC). The ATC provides a sequence of way points through which the aircraft trajectory must pass. The way points typically specify time, position, and velocity. The guidance problem is to synthesize a system state trajectory which satisfies both the ATC and aircraft constraints. Complications arise because the controlled process is multi-dimensional, multi-axis, nonlinear, highly coupled, and the state space is not flat. In addition, there is a multitude of possible operating modes, which may number in the hundreds. Each such mode defines a distinct state space model of the process by specifying the state space coordination, the partition of the controls into active controls and configuration controls, and the output map. Furthermore, mode transitions must be smooth. The guidance algorithm is based on the inversion of the pure feedback approximations, which is followed by iterative corrections for the effects of zero dynamics. The paper describes the structure and modules of the algorithm, and the performance is illustrated by several example aircraft maneuvers.

Author

Aircraft Maneuvers; Nonlinear Systems; Algorithms; Active Control

20020033028 Air Force Research Lab., Information Directorate, Rome, NY USA

Evolutionary Programming Techniques for Modeling of C2 Processes ***Final Report, Jan.-Oct. 2000***

Alexander, Steven M.; Jan. 2002; 13p; In English; Original contains color images

Contract(s)/Grant(s): AF Proj. 2304

Report No.(s): AD-A398540; AFRL-IF-RS-TR-2001-283; AFRL-IF-RS-TR-2001-283; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report contains a summary of the work done on this effort over the past 12 months. Two projects were performed, one of which investigates the basic ideas of evolutionary programming (EP) techniques, the other is an attempt to apply EP to an air campaign simulation. The first project provided evidence that EP can find the ideal solution in a complex space. It also seemed to show that a faster convergence to a good solution may be obtained by keeping the various parameters involved in EP within certain limits. Although there was insufficient time to complete the second project, it did show that it is possible to use neural networks (NN) to control a two-dimensional entity in two dimensional space, and that even randomly initialized (untrained) NNs can exhibit interesting behavior.

DTIC

Computer Programming; Mathematical Programming; Command and Control; Simulation

20020033029 Yale Univ., Dept. of Computer Science, New Haven, CT USA

Software Evolution Using Higher Order Typed (HOT) Language Technology ***Final Report, Aug. 1996-Jul. 1999***

Hudak, Paul; Shao, Zhong; Peterson, John; Jan. 2002; 10p; In English; Original contains color images

Contract(s)/Grant(s): F30602-96-2-0232; DARPA ORDER-D888; AF Proj. D883

Report No.(s): AD-A398538; AFRL-IF-RS-TR-2001-280; No Copyright; Avail: Defense Technical Information Center (DTIC)

The objective of this effort was to develop and demonstrate innovative approaches and techniques to support rapid incorporation of new requirements and technologies into an evolving system's capabilities and architecture. Their approach was to develop and demonstrate the integrated incremental programming environment by developing designs based on modular executable specs, capturing architectures by using a higher order typed (HOT) module language, and developing a programming environment which supports incremental programming. Yale developed and demonstrated HOT language technology in three areas: domain specific languages, compilers and architecture definition languages. They also created HOT ACME, an architectural description language (ADL). They collaborated with other groups on two widely used HOT languages: Haskell, as implemented by the Hugs interpreter, and ML, as implemented by SML/NJ using FLINT backend.

DTIC

Software Engineering; High Level Languages; Language Programming

62
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.

20020029301 NASA Ames Research Center, Moffett Field, CA USA
Asynchronous Transfer Mode (ATM) Switch Technology and Vendor Survey
Berry, Noemi, NASA Ames Research Center, USA; Jan. 03, 1995; 57p; In English
Contract(s)/Grant(s): NAS2-12961
Report No.(s): NAS-95-001; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Asynchronous Transfer Mode (ATM) switch and software features are described and compared in order to make switch comparisons meaningful. An ATM switch's performance cannot be measured solely based on its claimed switching capacity; traffic management and congestion control are emerging as the determining factors in an ATM network's ultimate throughput. Non-switch ATM products and experiences with actual installations of ATM networks are described. A compilation of select vendor offerings as of October 1994 is provided in chart form.
Author
Asynchronous Transfer Mode; Switches; Interfaces

20020029860 Transportation Research Board, National Cooperative Highway Research Program, Washington, DC USA
Configuration Management in Transportation Management Systems: A Synthesis of Highway Practice ***Final Report***
2001; 62p; In English
Report No.(s): PB2002-101959; TRB/NCHRP/SYS-294; TRB/NCHRP-31-10; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This synthesis report will be of interest to state transportation departments and regional and local agencies, as well as to the consultants that work with them. It identifies how configuration management (CM) is currently being developed and used by transportation management systems. It is intended as a resource document for professional just beginning to apply CM. This report can be used as a reference tool by agency managers and administrators, as well as other technical personal, in both the public and private sectors, to locate more in-depth material to support CM programs. The document addresses the fundamental concepts and principles of CM, the need for CM within transportation management systems, and available CM resources (including books, standards, websites, and software tools). It also contains information about the status of CM within transportation departments and detailed case studies of the use of CM both outside of and within the transportation field.
NTIS
Management Systems; Configuration Management; Transportation

20020030249 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK
Categorical Formalism for Interoperability Based on the Information Resource Dictionary Standard (IRDS)
Rossiter, N.; Heather, M. A.; Nelson, D. A.; Jun. 2001; 29p; In English
Report No.(s): PB2002-102558; CS-TR-717; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Interoperability is considered in the context of the ISO standards for the Information Resource Dictionary System (IRDS) which provide a complete definition of an information system from real-world abstractions through constructs employed for data and function descriptions to the physical data values held on disk. The IRDS gives a four-level architecture which is considered (1) informally in terms of an interpretation of the levels and the pairs between them, (2) in terms of mappings between the levels and (3) formally in terms of a composition of functors and adjoints across the various levels. Two examples are given of the application of IRDS in a categorical context, one comparing the mapping from abstractions to values in relational and object-based systems, the other comparing the mappings from the concept of time to date representations in a number of different approaches. Such comparisons provide a route for interoperability between heterogeneous systems.
NTIS
Interoperability; Dictionaries; Operators (Mathematics); Heterogeneity

20020030258 Naval Postgraduate School, Monterey, CA USA
A Training Framework for the Department of Defense Public Key Infrastructure
Ziemba, Marcia L.; Sep. 2001; 114p; In English
Report No.(s): AD-A397478; No Copyright; Avail: Defense Technical Information Center (DTIC)

Increased use of the Internet and the growth of electronic commerce within the Department of Defense (DoD) has led to the development and implementation of the DoD Public Key Infrastructure (PKI). Any PKI can only serve its intended purpose if there is trust within the system. This thesis reviews the basics of public (or asymmetric) key cryptography and its counterpart, symmetric key cryptography. It outlines the DoD's PKI implementation plan and the user roles identified within the infrastructure. Because a PKI relies entirely on trust, training for all users of a PKI is essential. The current approach to PKI training within the DoD will not provide all of its users with the required level of understanding of the system as a whole, or of the implications and ramifications that their individual actions may have upon the system. The decentralized, segmented, and inconsistent approach to PKI training will result in a lack of trust within the PKI. Training for the DoD PKI must be consistent, current, appropriate, and available to all users at any time. The author proposes a web-based training framework for the DoD PKI. The basic requirements and design of the framework are presented, and a prototype is developed for further testing and evaluation. Without the proper attention to training, the DoD PKI will be at risk, and may not perform its intended functions of providing the required authenticity and integrity across the various networks upon which DoD conducts business.
DTIC
Cryptography; Defense Program; Internets

20020030267 Naval Postgraduate School, Monterey, CA USA
Analyzing Threads and Processes in Windows CE
Burns, Titus R.; Sep. 2001; 102p; In English; Original contains color images
Report No.(s): AD-A397505; No Copyright; Avail: Defense Technical Information Center (DTIC)
Windows CE 3.0, also known as Pocket PC for palm-sized devices, is becoming increasingly popular among professionals and corporate enterprises. It is estimated that by 2004 Windows CE will have a share of 40% of the marketplace for palm-sized devices. The documented vulnerabilities against a major competitor of WinCE, Palm, and the proliferation of palm-sized devices highlight the need for security for these small-scale systems. This thesis is part of a larger project to enhance the security in WinCE. This thesis analyzed the threads and processes in WinCE, and discussed authentication, public key infrastructure (PKI) and future technologies as each relates to WinCE. The research discovered that Talisker, the next generation of WinCE, supports Kerberos an authentication protocol, and it also supports PKI (a key management system) components. Results of this thesis show that security can be enhanced in WinCE without requiring a change to its code base.
DTIC
Computer Information Security; Computer Programs

20020030277 Naval Postgraduate School, Monterey, CA USA
The Effects of Natural Locomotion on Maneuvering Task Performance in Virtual and Real Environments
Unguder, Eray; Sep. 2001; 139p; In English; Original contains color images
Report No.(s): AD-A397573; No Copyright; Avail: Defense Technical Information Center (DTIC)
This thesis investigates human performance differences on maneuvering tasks in virtual and real spaces when a natural locomotion technique is used as opposed to an abstraction through a device such as a treadmill. The motivation for the development of locomotion devices thus far has been driven by the assumption that the ”perfect” device will result in human performance levels comparable to the real world. This thesis challenges this assumption under the hypothesis that other factors beyond the locomotion device contribute to performance degradation. An experiment was conducted to study the effects of these other factors. The experiment studied sidestepping, kneeling, looking around a corner, and backward movement tasks related to a building clearing exercise. The participants physically walked through the environment under all conditions. There were three treatments: real world (no display, physical objects present), virtual world (head-mounted display, no physical objects), and real and virtual world combined (head-mounted display, physical objects present). The results suggest that performance and behavior are not the same across conditions with the real world condition being uniformly better than the virtual conditions. This evidence supports the claim that even with identical locomotion techniques, performance and behaviors change from the real to the virtual world.
DTIC
Locomotion; Maneuvers; Head-Up Displays; Virtual Reality

20020032329 Analytic Sciences Corp., Arlington, VA USA
The Economic Impacts of NIST's Data Encryption Standard (DES) Program
Leech, David P.; Chinworth, Michael W.; Oct. 2001; 85p; In English; Original contains color images
Report No.(s): AD-A398771; No Copyright; Avail: Defense Technical Information Center (DTIC)

The electronic transactions occurring routinely today in businesses and households have their basis in technological developments of just a few decades ago. These include vastly improved computing power, increased accessibility to communications through the development of the Internet and World Wide Web, and the implementation of behind the scenes technologies that assure the privacy and security of these various transactions. Encryption algorithms and methods are among those technologies that are less apparent to casual or business users, but are central to virtually every funds transfer, business-to-business data transfer or internal company data input and output today. This report examines the evolution and economic significance of NIST's Data Encryption Standard (DES) Program. DES was developed by the National Institute of Standards and Technology (NIST), formerly the National Bureau of Standards, (NBS) for protecting sensitive, unclassified information.
DTIC
Economic Impact; Cryptography; Computer Information Security; Standards

20020032337 National Inst. of Standards and Technology, Gaithersburg, MD USA
Common Criteria Evaluation and Validation Scheme Validation Report: IBM corporation, IBM Cryptographic Security Chip for PC Clients Manufactured by ATMEL (AT90SP0801)
Oct. 10, 2001; 15p; In English
Report No.(s): AD-A398822; CCEVS-VR-01-0005; No Copyright; Avail: Defense Technical Information Center (DTIC)
This report documents the NIAP (National Information Assurance Partnership) validators assessment of the CCEVS (Common Criteria Evaluation and Validation Scheme) evaluation of the IBM Cryptographic Security Chip for PC (personal computer) Clients manufactured by Atmel Corporation (AT90SP0801). It presents the evaluation results, their justifications, and the conformance result.
DTIC
Access Control; Computer Information Security

20020032338 National Inst. of Standards and Technology, Gaithersburg, MD USA
Common Criteria Evaluation and Validation Scheme Validation Report: Smart Card Security User Group (SCSUG) Smart Card Protection Profile (SCPP), Version 3.0
Oct. 22, 2001; 17p; In English
Report No.(s): AD-A398821; CCEVS-VR-01-0007; No Copyright; Avail: Defense Technical Information Center (DTIC)
An evaluation of the Smart Card User Group Smart Card Protection Profile (SCSUG-SCPP), v3.0, was begun in February 2001 and concluded in October 2001. The evaluation was performed by the Seculab Inc. Common Criteria Testing Laboratory (CCTL) in the USA, in accordance with the requirements drawn from the Common Criteria for Information Technology Security Evaluation (CC) CC, Version 2.1, Part 3, Class APE: Protection Profile Evaluation. The assurance activities in this CC class offer confidence that the SCPP contains requirements that are: Justifiably included to counter stated threats and meet realistic security objectives; Internally consistent and coherent; Technically sound.
DTIC
Information Systems; Access Control

20020032618 Office of the Secretary of Defense, Washington, DC USA
Information Assurance Readiness Assessment
Bartlett, Terry; Jun. 2000; 30p; In English; Original contains color images
Report No.(s): AD-A398815; No Copyright; Avail: Defense Technical Information Center (DTIC)
Presentation on Information Assurance Readiness for the Defense-wide Information Assurance Program (DIAP).
DTIC
Defense Program; Computer Information Security; Assessments

20020033016 NASA Ames Research Center, Moffett Field, CA USA
NAS Parallel Benchmarks Results
Subhash, Saini, Computer Sciences Corp., USA; Bailey, David H., NASA Ames Research Center, USA; [1995]; 1p; In English; Supercomputing 1995, 4-8 Dec. 1995, San Diego, CA, USA
Contract(s)/Grant(s): NAS2-12961; RTOP 536-01-50; No Copyright; Avail: Issuing Activity; Abstract Only
The NAS Parallel Benchmarks (NPB) were developed in 1991 at NASA Ames Research Center to study the performance of parallel supercomputers. The eight benchmark problems are specified in a pencil and paper fashion i.e. the complete details of the problem to be solved are given in a technical document, and except for a few restrictions, benchmarkers are free to select

the language constructs and implementation techniques best suited for a particular system. In this paper, we present new NPB performance results for the following systems: (a) Parallel-Vector Processors: Cray C90, Cray T'90 and Fujitsu VPP500; (b) Highly Parallel Processors: Cray T3D, IBM SP2 and IBM SP-TN2 (Thin Nodes 2); (c) Symmetric Multiprocessing Processors: Convex Exemplar SPP1000, Cray J90, DEC Alpha Server 8400 5/300, and SGI Power Challenge XL. We also present sustained performance per dollar for Class B LU, SP and BT benchmarks. We also mention NAS future plans of NPB.
Author
Multiprocessing (Computers); Supercomputers; Computer Systems Performance

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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.

20020029278 National Energy Technology Lab., Pittsburgh, PA USA
Robot task scene analyzer
Hamel, W. R.; Everett, S.; Aug. 01, 2000; 142p; In English
Report No.(s): DE2001-789501; AR26-97FT34314-01; No Copyright; Avail: Department of Energy Information Bridge

Environmental restoration and waste management (ER&WM) challenges in the United State Department of Energy (DOE), and around the world, involve radiation or other hazards which will necessitate the use of remote operations to protect human workers from dangerous exposures. Remote operations carry the implication of greater cost since remote work systems are inherently less productive than contact human work due to the inefficiencies/complexities of teleoperation. To reduce costs and improve quality, much attention has been focused on methods to improve the productivity of combined human operator/remote equipment systems; the achievements to date are modest at best. The most promising avenue in the near term is to supplement conventional remote work systems with robotic planning and control techniques borrowed from manufacturing and other domains where robotic automation has been used. Practical combinations of teleoperation and robotic control will yield telerobotic work systems that outperform currently available remote equipment. It is believed that practical telerobotic systems may increase remote work efficiencies significantly. Increases of 30% to 50% have been conservatively estimated for typical remote operations. It is important to recognize that the basic hardware and software features of most modern remote manipulation systems can readily accommodate the functionality require for telerobotics. Further, several of the additional system ingredients necessary to implement telerobotic control-machine vision, 3D object and workspace modeling, automatic tool path generation and collision-free trajectory planning-are existent.
NTIS
Robots; Remote Control; Robotics; Control Systems Design; Computer Programs

20020029290 Sandia National Labs., Albuquerque, NM USA
Adaptive Sensor Optimization and Cognitive Image Processing Using Autonomous Optical Nueroprocessors
Cameron, S. M.; Oct. 01, 2001; 20p; In English
Report No.(s): DE2001-789525; SAND2001-3304; No Copyright; Avail: Department of Energy Information Bridge

Measurement and signal intelligence demand has created new requirements for information management and interoperability as they affect surveillance and situational awareness. Integration of on-board autonomous learning and adaptive control structures within a remote sensing platform architecture would substantially improve the utility of intelligence collection by facilitating real-time optimization of measurement parameters for variable field conditions. A problem faced by conventional digital implementations of intelligent systems is the conflict between a distributed parallel structure on a sequential serial interface functionally degrading bandwidth and response time. In contrast, optically designed networks exhibit the massive parallelism and interconnect density needed to perform complex cognitive functions within a dynamic asynchronous environment. Recently, all-optical self-organizing neural networks exhibiting emergent collective behavior which mimic perception, recognition, association, and contemplative learning have been realized using photorefractive holography in combination with sensory systems for feature maps, threshold decomposition, image enhancement, and nonlinear matched filters. Such hybrid information processors depart from the classical computational paradigm based on analytic rules-based algorithms and instead utilize unsupervised generalization and perceptron-like exploratory or improvisational behaviors to evolve toward optimized solutions. These systems are robust to instrumental systematics or corrupting noise and can enrich knowledge structures by allowing competition between multiple hypotheses. This property enables them to rapidly adapt or self-compensate for dynamic or imprecise conditions which would be unstable using conventional linear control models. by incorporating an intelligent optical

neuroprocessor in the back plane of an imaging sensor, a broad class of high-level cognitive image analysis problems including geometric change detection, pattern recognition, and correlated feature extraction can be realized in an inherently parallel fashion without information bottle necking or external supervision. Using this approach, we believe that autonomous control systems embodied with basic adaptive decision-theoretic capabilities can be developed for imaging and surveillance sensors to improve discrimination in stressing operational environments.
NTIS
Image Processing; Automatic Control; Digital Systems; Image Enhancement; Optical Measurement

20020029295 Sandia National Labs., Albuquerque, NM USA
Dexterous Manipulation: Making Remote Manipulators Easy to Use
Harrigan, R. W.; Bennett, P. C.; Nov. 01, 2001; 18p; In English
Report No.(s): DE2001-789598; SAND2001-3622; No Copyright; Avail: Department of Energy Information Bridge

Increasing numbers of hazards, and increasingly effective remote technologies have driven the need for more remote and robotic systems in the field. Military and civilian explosive ordnance disposal (EOD) technicians, first-responders to chemical and biological devices, civilian HAZMAT teams, and radiation workers remediating and repairing nuclear installations all have a requirement to minimize exposure to bodily harm in the execution of their duties. to remove the operators from the vicinity of the hazard, robotics technologists have typically tried to provide either remote manual (teleoperated) systems or completely autonomous manipulation systems. Effective teleoperated manipulation typically requires very extensive and perishable training, and frequently results in overly-demanding and tedious operation that is especially concerning in hazardous or high consequence environments. At the opposite end of the spectrum, computer-controlled autonomous operation in unstructured environments frequently fails to provide adequate response to the environment needed to build the confidence that the end users require for widespread adoption. Neither approach appears to fulfill the needs of most end users very well. An alternative approach is to break the strangle hold that teleoperation places on the exploitation of computer control while leaving the operator in the loop to take advantage of the operator's perceptual and decision making capabilities. This report describes research that is enabling gradual introduction of computer control and decision making into operator-supervised robotic manipulation systems. The net effect is to make life easier for the robot operator thus gaining acceptance and trust. Building upon this trust, technology developers gain experience in how operators want to use the robots and the levels of technology with which they feel comfortable. Technology is then developed to address those operational desires and introduced incrementally to provide higher capability robot systems. Operating laboratory prototype systems are described as well as experiments involving end-users to measure improvements in performance. The path for incremental technology insertion based upon the functional needs of the user are discussed.
NTIS
Remote Manipulator System; Numerical Control; Transponders; Autonomy; Decision Making

20020030234 Argonne National Lab., IL USA
First experiences integrating PC distributed I/O into Argonne's atlas control system
Munson, F. H.; Quock, D. E. R.; Dean, S. L.; Eder, K. J.; Nov. 12, 2001; 3p; In English
Report No.(s): DE2001-789733; ANL/PHY/CP-106206; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The roots of ATLAS (Argonne Tandem-Linac Accelerator System) date back to the early 1960s. Located at the Argonne National Laboratory, the accelerator has been designated a National User Facility, which focuses primarily on heavy-ion nuclear physics. Like the accelerator it services, the control system has been in a constant state of evolution. The present real-time portion of the control system is based on the commercial product Vsystem (1). While Vsystem has always been capable of distributed I/O processing, the latest offering of this product provides for the use of relatively inexpensive PC hardware and software. This paper reviews the status of the ATLAS control system, and describes first experiences with PC distributed I/O.
NTIS
Particle Accelerators; Personal Computers; Distributed Processing; Linear Accelerators; Computer Programs

20020030829 Air Force Research Lab., Information Directorate, Rome, NY USA
Developing Intelligently Interactive Computerized Wargames ***Final Report, Feb. 2000-Feb 2001***
Alexander, Steven M.; Ross, David O.; Lloyd, William J.; Jan. 2002; 11p; In English
Contract(s)/Grant(s): AF Proj. 459S
Report No.(s): AD-A398447; AFRL-IF-RS-TR-2001-284; No Copyright; Avail: Defense Technical Information Center (DTIC)

The commercial computer game industry has recently made giant technological leaps. These advances have not been used to their full potential. Many of today's computer games have better graphics, sound and interfaces than the most advanced military

simulations, and are much less expensive. However, most games in the commercial sector fall short when it comes to artificial intelligence (AI). People are beginning to demand improved AI, and for good reason. Once you have determined the behavior of the computer forces, the game ceases to be challenging. It would be beneficial to the military to harness the power of commercial games outstanding graphics and intuitive interfaces, and integrate an advanced AI into such a game. This project focuses on the genre of games known as strategy games or war games. They are command and control (C2) oriented games where the user commands a group of forces, competing against enemy forces. We evaluated fifteen commercial games of this genre to attempt to determine the feasibility of incorporating an advanced AI into one or more of them. We propose that government experts in AI and/or C2 work with commercial game developers to create compelling, advanced simulations for use in military Planning and training.
DTIC
Artificial Intelligence; Military Operations; War Games; Command and Control

20020033018 NASA Ames Research Center, Moffett Field, CA USA
A Dual-Route Model that Learns to Pronounce English Words
Remington, Roger W., NASA Ames Research Center, USA; Miller, Craig S., Carnegie-Mellon Univ., USA; [1995]; 1p; In English; Annual Cognitive Science Society Meeting, 22-25 Jul. 1995, Pittsburgh, PA, USA; Sponsored by Cognitive Science Society, USA
Contract(s)/Grant(s): RTOP 505-64-13; No Copyright; Avail: Issuing Activity; Abstract Only

This paper describes a model that learns to pronounce English words. Learning occurs in two modules: 1) a rule-based module that constructs pronunciations by phonetic analysis of the letter string, and 2) a whole-word module that learns to associate subsets of letters to the pronunciation, without phonetic analysis. In a simulation on a corpus of over 300 words the model produced pronunciation latencies consistent with the effects of word frequency and orthographic regularity observed in human data. Implications of the model for theories of visual word processing and reading instruction are discussed.
Author
Phonetics; Words (Language); Visual Perception

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NUMERICAL ANALYSIS

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

20020028161 Brown Univ., Providence, RI USA
Applicable and Robust Geometric Computing *Final Report*
Preparata, Franco P.; Agarwal, Pankaj K.; Tamassia, Roberto; Vitter, Jeffrey S.; Goodrich, Michael T.; Dec. 14, 2001; 40p; In English
Contract(s)/Grant(s): DAAH04-96-1-0013
Report No.(s): AD-A398645; ARO-34990.65-MA-MUR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research project is aimed at aimed at facilitating an effective technology transfer from computational geometry to the various applied fields to which it is relevant. Our technical contributions include algorithmic foundations, practical methodologies, emerging technologies, and applications.
DTIC
Algorithms; Computational Geometry; Technology Transfer

20020030138 Naval Postgraduate School, Dept. of Electrical and Computer Engineering, Monterey, CA USA
A Computationally Efficient Algorithm for Disturbance Cancellation to Meet the Requirements for Optical Payloads in Satellites
Taranti, Christian Giorgio; Sep. 2001; 150p; In English; Original contains color images
Report No.(s): AD-A397414; No Copyright; Avail: Defense Technical Information Center (DTIC)

Vibration control is a very important issue in satellites. The new high-resolution digital imaging devices are especially sensitive to vibrations. Antennas used in laser communications also require a very quiet environment so that their performance is not degraded. The Stewart platform is capable of isolating an optical payload from the noisy spacecraft bus. Until recently only passive methods were used in all vibration isolation applications. Recent advances in Digital Signal Processing techniques made the development of vibration control algorithms possible but these usually require large computational power. This work explores using a computationally efficient vibration-isolation method for optical payloads by using hexapods. The method suppresses the

vibration at the assigned frequencies and does not affect unassigned frequencies if the plant is linear. The mathematical analysis includes convergence analysis and the effect of unassigned frequencies in the output. The computational requirements of the algorithm is evaluated and is compared to the Multiple-Error Least Mean Square. The method is very robust to nonlinearities; its performance is comparable to the Multiple-Error Least Mean Square with a fraction of the computational time and memory requirements. Also it requires very little plant knowledge. Theoretical results are verified through simulations using a Single-Input/Single-Output plant and a nonlinear hexapod model. The controller was also experimentally validated in two different hexapods and the performance was found to be similar to or better than the performance obtained with the Multiple-Error Least Mean Square method when a noisy reference signal is used.
DTIC
Algorithms; Satellite-Borne Instruments; Vibration Isolators; Optical Equipment

65
STATISTICS AND PROBABILITY

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

20020027699 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Probabilistic Approaches to Quantity Determination and Cost Evaluation in System Acquisition
Gaudette, Kevin J.; Jan. 02, 2002; 28p; In English
Report No.(s): AD-A398509; AFIT-CI01-315; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Quantity uncertainty is a very real problem experienced in the acquisition of systems. Particularly when the systems have a diverse customer base and contracts span several years, exact quantities can be difficult to estimate. Typically, program managers guess at the most probable quantity and use that estimate to drive the Request For Proposals (RFP) and subsequent source selection. When the actual quantity purchased differs from the estimate, additional source selections or renegotiations are needed, usually driving up the unit price in the process. Two alternative probabilistic methods are presented that deal with this problem, with the effect of reducing the quantity uncertainty risk. One substitutes a probabilistically estimated quantity (PEQ) for the most probable quantity, often called the best estimated quantity (BEQ) in government acquisition. The second, called the Probabilistic Evaluation of Price (PEP), abandons the estimate altogether in favor of requiring bid prices for all possible quantities. These bid prices are then combined probabilistically into an overall evaluation price. The two methods are presented with the help of a simple example, and the lessons learned from implementation in a major joint program are included to address advantages and limitations gleaned from actual experience.
DTIC
Probability Theory; Data Acquisition; Cost Analysis; Market Research

20020031770 Environmental Protection Agency, National Exposure Research Lab., Las Vegas, NV USA
Parametric and Nonparametric (MARS; Multivariate Additive Regression Splines) Logistic Regressions for Prediction of a Dichotomous Response Variable with an Example for Presence/Absence of an Amphibian
Nash, M. S.; Bradford, D.; Oct. 2001; 54p; In English
Report No.(s): PB2002-102297; EPA/600/R-01/081; NERL-LV-ESD-01-128; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this report is to provide a reference manual that could be used by investigators for making informed use of logistic regression using two methods (standard logistic regression and MARS). The details for analyses of relationships between a dependent binary response variable (e.g., presence/absence) and a set of independent variables are provided step by step for use by scientists who are not statisticians. Details of such statistical analyses and their assumptions are often omitted from published literature, yet such details are essential to the proper conduct of statistical analyses and interpretation of results. In this report, we use a data set for amphibian presence/absence and associated habitat variables as an example.
NTIS
Logistics; Dependent Variables; Manuals; Reference Systems; Regression Analysis

20020032689 Florida Univ., Gainesville, FL USA
Assessing and Improving Team Decision Making ***Final Report, 1 NOv 1999-31 Oct. 2001***
Sorkin, Robert D.; Feb. 01, 2002; 14p; In English
Contract(s)/Grant(s): F49620-00-1-0041
Report No.(s): AD-A399024; AFRL-SR-BL-TR-02-0042; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project employed analytical and experimental techniques from signal detection theory to (a) assess the accuracy of team performance, (b) identify sources of inefficiency in team decision making, (c) specify how team members utilize information received from sources having different statistical properties, and (d) model the team deliberation process. The team's task was to decide whether signal-plus-noise or noise-alone had occurred, based on individual graphical displays presented to the team members. Team performance was shown to depend on (1) the signal-to-noise level of members' displays and the efficiency of individual member detection (compared to the statistical optimal), (2) the correlation (common noise) among members' displays, (3) constraints on member communication and interaction, and (4) how efficiently the team combined member judgments to form the team's decision (including mandatory voting rules). The internal correlation, expertise, and bias of different information sources influenced the decision weights that team members gave to these sources, sometimes in a non-optimal fashion. Using a Bayesian network model of team deliberation, the project began to quantify important aspects of the deliberation process such as the interaction protocols used by members of a networked team.
DTIC
Decision Making; Statistical Analysis; Detection; Mathematical Models

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

Includes mathematical modeling of systems; network analysis; mathematical programming; decision theory; and game theory.

20020030275 Naval Postgraduate School, Monterey, CA USA
Implementation of a Multi-Agent Simulation for the NPSNET-V Virtual Environment Research Project
Washington, David B.; Sep. 2001; 117p; In English; Original contains color images
Report No.(s): AD-A397602; No Copyright; Avail: Defense Technical Information Center (DTIC)

Traditional networked military simulation systems are technologically frozen the moment they are completed, thus limiting the participants that can interact in the simulation. When training for urgent missions in emerging conflict areas, assimilating new models, threat behaviors, and new terrain environments into the simulators requires lengthy integration, is prohibitively costly, and is non-distributable electronically at runtime. Threat behaviors are pre-scripted, lack organization, and do not accurately portray doctrine or rules-of engagement. NPSNET-V is a novel architecture for networked simulations that supports scalable virtual worlds with built-in dynamic entity loading. These advances address each of the above concerns: scalability, entity and environment distribution, and dynamic technology loading. by combining this architecture with a system for creating autonomous, adaptable agents, threat forces can be accurately simulated. This architecture is useful for proposing designs for strategies, tactics, or force packages during the conduct of experiments. The result of this thesis is a proof-of-concept application demonstrating the utility of these architectural advances. In this application, numerous autonomous agents form complex, dynamic, and adaptable interactions with resident and remote heterogeneous entities. These results define the course for future military models and simulations.
DTIC
Virtual Reality; Research Projects; Computerized Simulation; Architecture (Computers); Autonomy; Computer Networks

67
THEORETICAL MATHEMATICS

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

20020027355 NASA Glenn Research Center, Cleveland, OH USA
Sub-Nyquist Sampling and Moire-Like Waveform Distortions
Williams, Glenn L., NASA Glenn Research Center, USA; [2000]; 10p; In English; 47th International Instrumentation Symposium, 21-24 May 2001, Denver, CO, USA; Sponsored by Instrument Society of America, USA
Contract(s)/Grant(s): RTOP 940-30-09-21; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Investigations of aliasing effects in digital waveform sampling have revealed the existence of a mathematical field and a pseudo-alias domain lying to the left of a ”Nyquist line” in a plane defining the boundary between two domains of sampling. to the right of the line lies the classic alias domain. For signals band-limited below the Nyquist limit, displayed output may show a false modulation envelope. The effect occurs whenever the sample rate and the signal frequency are related by ratios of mutually

prime integers. Belying the principal of a 10:1 sampling ratio being ”good enough”, this distortion easily occurs in graphed one-dimensional waveforms and two-dimensional images and occurs daily on television.
Author
Distortion; Waveforms; Mathematical Models; Nyquist Frequencies; Digital Electronics

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.

20020027276 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Detailed Study of the He-3 Nucleus through Response function Separations at High Momentum Transfer
Higinbotham, D. W.; Dec. 01, 2001; 9p; In English
Report No.(s): DE2001-789661; JLAB-PHY-01-32; DOE/ER/40150-1973; No Copyright; Avail: Department of Energy Information Bridge
In order to further our understanding of the few body system, a new series of measurements on the reaction has been made at Jefferson Lab.
NTIS
Momentum Transfer; Nucleons; Helium Isotopes

20020027286 Brookhaven National Lab., Upton, NY USA
Primary Target Facility for a Neutrino Factory Based on Muon Beams
Hassenein,; Kahn,; King,; Kirk,; Ludewig,; Jun. 18, 2001; 6p; In English
Report No.(s): DE2001-789443; BNL-68736; No Copyright; Avail: Department of Energy Information Bridge
Neutrino beams from the decay of muons in a storage ring offer the prospect of very high flux, well-understood spectra, and equal numbers of electron and muon neutrinos, as desirable for detailed exploration of neutrino oscillations via long baseline detectors. Such beams require large numbers of muons, and hence a high performance target station at which a 1-4 MW proton beam of 16-24 GeV impinges on a compact target, all inside a high field solenoid channel to capture as much of the phase volume of soft pions as possible. A first concept was based on a carbon target, as reported in 2000 the Neutrino Factory Study-I. A higher performance option based on a free mercury jet has been studied in 2001 as part of the Neutrino Factory Feasibility Study-II. An overview of a mercury jet target facility is presented here, including requirements, design concept and summaries of simulated performance.
NTIS
Muons; Neutrinos; Targets

20020027287 Brookhaven National Lab., Upton, NY USA
R and D Program for Targetry at a Neutrino Factory
McDonald,; Brown,; Finfrock,; Gassner,; Greene,; Jun. 18, 2001; 6p; In English
Report No.(s): DE2001-789442; BNL-68733; No Copyright; Avail: Department of Energy Information Bridge
The need for intense muon beams for muon colliders and for neutrino factories based on muon storage rings leads to a concept of 1-4 MW proton beams incident a moving target that is inside a 20-T solenoid magnet, with a mercury jet as a preferred example. Novel technical issues for such a system include disruption of the mercury jet by the proton beam and distortion of the jet on entering the solenoid, as well as more conventional issues of materials lifetime and handling of activated materials in an intense radiation environment. As part of the research and development (R and D) program of the Neutrino Factory and Muon Collider Collaboration, R and D effort related to targetry is being performed within the context of BNL E951, first results of which are discussed here and in other contributions to this conference.
NTIS
Muons; Neutrinos; Proton Beams; Research and Development

20020027359 Brookhaven National Lab., Upton, NY USA

Phase rotation at the front end of a neutrino factory

Kirk,; Gallardo,; Palmer,; Green,; Reginato,; Jun. 18, 2001; 6p; In English

Report No.(s): DE2001-789378; BNL-68734; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The muon collection scheme for a muon-storage-ring-based Neutrino Factory consists of a target irradiated with a 1 MW proton beam followed by a 30-m decay channel and then a 300-m long induction linac phase rotation. The purpose of the induction-linac section is to reduce the (delta)E/E spread of the collected muons to a value which is manageable for the subsequent buncher and cooling sections. We describe in this paper the overall design concept of the phase-rotation system and give key parameters for the induction linacs.

NTIS

Neutrinos; Linear Accelerators; Muon Spin Rotation

20020027484 Fermi National Accelerator Lab., Batavia, IL USA

Heavy-quark parton distribution functions and their uncertainties

Sullivan, Z.; Nadolsky, P. M.; Dec. 07, 2001; 3p; In English

Report No.(s): DE2001-789366; FERMILAB-CONF-01/329-T; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We investigate the uncertainties of the heavy-quark parton distribution functions in the variable avor number scheme. Because the charm- and bottom-quark parton distribution functions (PDFs) are constructed predominantly from the gluon PDF, it is a common practice to assume that the heavy-quark and gluon uncertainties are the same. We show that this approximation is a reasonable first guess, but it is better for bottom quarks than charm quarks. We calculate the PDF uncertainty for t-channel single-top-quark production using the Hessian matrix method, and predict a cross section of 2.12(sub -0.29)(sup +0.32) pb at run II of the Tevatron.

NTIS

Quark Parton Model; Distribution Functions

20020027485 Brookhaven National Lab., Upton, NY USA

Thermodynamic interaction of the primary proton beam with a mercury jet target at a neutrino factory source

Simos,; Ludewig,; Kirk,; Thieberger,; McDonald,; Jun. 18, 2001; 6p; In English

Report No.(s): DE2001-789364; BNL-68738; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper addresses the thermodynamic interaction of an intense proton beam with the proposed mercury jet target at a neutrino factory or muon collider source, and the consequences of the generated pressure waves on the target integrity. Specifically, a 24 GeV proton beam with approximately 1.6e13 protons per pulse and a pulse length of 2 nanosec will interact with a 1 cm diameter mercury jet within a 20 Tesla magnetic field. In one option, a train of six such proton pulses is to be delivered on target within 2 microsec, in which case the state of the mercury jet following the interaction with each pulse is critical. Using the equation of state for mercury from the SESAME library, in combination with the energy deposition rates calculated the by the hadron interaction code MARS, the induced 3-D pressure field in the target is estimated. The consequent pressure wave propagation and attenuation in the mercury jet is calculated using an ANSYS code transient analysis, and the state of the mercury jet at the time of arrival of the subsequent pulse is assessed. The amplitude of the pressure wave reaching the nozzle that ejects the mercury jet into the magnetic field is estimated and the potential for mechanical damage is addressed.

NTIS

Neutrinos; Thermodynamics; Proton Beams; Mercury (Metal)

20020027486 Brookhaven National Lab., Upton, NY USA

Conceptual engineering design of a bunch rotation cavity for a pion production and capture experiment

Rathke,; Schultheiss,; Rose,; Kirk,; Jun. 18, 2001; 6p; In English

Report No.(s): DE2001-789363; BNL-68737; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A conceptual design for a pion bunch rotator cavity has been performed. The cavity is an integral part of a pion production target and capture system envisioned as an experiment on the AGS at Brookhaven National Laboratory in support of the Muon Collider Collaboration. The design specification calls for a single gap cavity operating at peak fields of 6 MV/m, limited by available RF, and an RF frequency of approximately 71 MHz, a harmonic of AGS. The cavity is located directly following the capture and matching solenoids and must accommodate the decay solenoids within the reentrant noses of the cavity. These requirements place severe restrictions upon the physical structure of the cavity. This paper will present the engineering design

and supporting RF, thermal, and structural analysis to achieve a mechanically stable cavity with good steady state and transient thermal and RF performance. In addition, design details and the approach to fabrication will be discussed.
NTIS
Pions; Rotation; Design Analysis; Particle Production; Fabrication; Bunching

20020027550 Northwestern Univ., Evanston, IL USA
Coherent Dynamics of Magnetic Particles ***Final Report***
Chandrasekhar, Venkat; Dec. 17, 2001; 9p; In English
Contract(s)/Grant(s): DAAD19-99-1-0334
Report No.(s): AD-A398315; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This project encompassed experimental and theoretical research aimed at understanding the underlying physics of dynamically driven magnetization reversal in magnetic nanoparticles. Nanoparticle arrays comprising circular, elliptical, and cylindrical dots were patterned by e-beam lithography. The samples were characterized by AEM, MFM and dc magnetization measurements, and their dynamic properties determined by ferromagnetic resonance (FMR) measurements. Detailed numerical solutions of the micromagnetic equations of motion have explored the origin of the peaks observed in the FMR spectrum of the ferromagnetic arrays.
DTIC
Dynamic Characteristics; Ferromagnetic Materials; Numerical Analysis; Magnetic Properties

20020027666 Brookhaven National Lab., Upton, NY USA
Chaotic behavior of the bunched beam
Parsa,; Zadorozhny,; Jun. 18, 2001; 5p; In English
Report No.(s): DE2001-789361; BNL-68720; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Using the self consistent Vlasov equation we discuss a wave dynamical system to describe the chaotic behavior of the bunched beam, present some results of the existence of the global solutions as the generalized functions. Disappearance of the first integral, and appearance of the wave packet chaos due to birth of the continuous spectrum in Vlasov system is studied. We propose a new concept of wave packet chaos to describe the chaotic behavior of the wave dynamical system.
NTIS
Chaos; Bunching; Beams (Radiation); Dynamical Systems; Quantum Mechanics

20020027667 Brookhaven National Lab., Upton, NY USA
Extraction of Highly Charged Au Ions from a Multiamphere Electron Beam EBIS at BNL
Beebe,; Alessi,; Gould,; Graham,; Kponou,; Sep. 02, 2001; 12p; In English
Report No.(s): DE2001-789440; BNL-68744; No Copyright; Avail: Department of Energy Information Bridge
Excellent progress has been made in the operation of the Brookhaven National Laboratory's Electron Beam Ion Source (EBIS), which is a prototype for an EBIS that could meet requirements for a Relativistic Heavy Ion Collider (RHIC) preinjector. We have achieved very stable operation of the electron beam at 10 A through the EBIS trap. Ion injection of low charge gold ions from a LEVA ion source and subsequent extraction of these ions with most probable charge state AU(34+) has been demonstrated with electron beams up to 8 A. The total ion charge for gold measured on current transformer at the EBIS exit was 55 nC after a 30 ms confinement period. This corresponds to approximately 85% of the theoretical ion trap capacity and exceeds our goal of 50% neutralization. The collected ion charge is proportional to the electron current and the gold charge state scales with the electron current density. Details of the EBIS configuration, total charge measurements, and TOF spectra are given.
NTIS
Electron Beams; Ion Charge; Ion Sources

20020027680 NASA Ames Research Center, Moffett Field, CA USA
Resistance to Sliding on Atomic Scales
Dominik, C.; Tielens, A.; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 399-20-10-27; No Copyright; Avail: Issuing Activity; Abstract Only
The structure and stability of agglomerates of micron-sized particles is determined by the mechanical properties of the individual contacts between the constituent particles. In this paper we study the possibility of aggregate rearrangements by sliding. Since the contacts between (sub)micron particles are only a few hundred atoms in diameter, processes on atomic levels will play the dominating roll. We study a theoretical model of sliding friction for surfaces that are either flat or contain steps in their grids. The results show that sliding over flat surfaces may produce a large range of friction coefficients, including zero if the adhesive

forces are small compared to the binding forces inside a body. However, both grid alignment and steps in the surface will lead to high values for friction. These processes combined virtually eliminate the possibility of sliding in a collision of two (sub)micron sized particles at velocities low enough for sticking to occur. On the other hand we show that in collisions between aggregates sliding may be an important factor for energy dissipation and compaction.
Author
Mathematical Models; Sliding Friction; Resistance; Atomic Structure; Agglomeration

20020027991 National Inst. of Standards and Technology, Gaithersburg, MD USA
Journal of Research of the National Institute of Standards and Technology, September/October 2001. Volume 106, No. 5
2001; 124p; In English
Report No.(s): PB2002-102212; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Fraunhofer Diffraction Effects on Total Power for a Planckian Source; Environmental Radiation Monitoring at NBS/NIST from 1960 through 2000; Vibrational Branching Ratios and Asymmetry Parameters in the Photoionization of Carbon Dioxide in the Region between 650 A and 840 A; Transfer Calibration Validation Tests on a Heat Flux Sensor in the 51 mm High-Temperature Blackbody; Precision Ultrasonic Wave Measurements with Simple Equipment; Studies of Excess Heat and Convection in a Water Calorimeter; and Treasure of the Past IX: Exposure Standardization of Iodinie-125 Seeds used for Brachytherapy; Conference Reports: NIST-ASME Workshop on Uncertainty in Dimensional Measurements; News Briefs; and Standard Reference Materials.
NTIS
Standards; Calibrating; Dimensional Measurement; Carbon Dioxide; Calorimeters; Ultrasonic Radiation

20020028002 Fermi National Accelerator Lab., Batavia, IL USA
Cost optimization of a hadron collider
Kashikhin, V. V.; Limon, P. J.; Nov. 30, 2001; 15p; In English
Report No.(s): DE2001-789072; FERMILAB-TM-2160; No Copyright; Avail: Department of Energy Information Bridge
This paper discusses cost scaling laws and optimization of hadron colliders based on high field magnets. Using a few simplifying assumptions that should give a reasonable approximation, cost of the magnet is divided among several major components. Scaling law for every component is determined along with the weight factors that allow cost comparison between different magnet designs. Cost of hadron collider as a function of field, aperture size and critical current density in superconductor is described analytically that allows cost optimization by changing magnet parameters. The optimum magnetic field is determined for machines based on NbTi superconductor, operating at 4.2 K or 1.9 K and NB(sub 3)Sn superconductor operating at 4.2 K. Analyzed influence of main magnet design parameters on a machine cost provided information on ways leading to the magnet cost reduction. Economical justification of a NB(sub 3)Sn collider is performed, which enables the determination of the maximum price ratio between NB(sub 3)Sn and NbTi superconductors that makes NB(sub 3)Sn collider economically effective.
NTIS
Linear Accelerators; Hadrons; Magnets; Superconductors (Materials); Cost Reduction; Particle Collisions; Optimization

20020028008 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Grain orientation and strain measurements in sub-micron wide passivated individual aluminum test structures
Tamura, N.; Valek, B. C.; Spolenak, R.; MacDowell, A. A.; Celestre, R. S.; Mar. 01, 2001; 6p; In English
Report No.(s): DE2001-789111; LBNL-45575; No Copyright; Avail: Department of Energy Information Bridge
An X-ray microdiffraction dedicated beamline, combining white and monochromatic beam capabilities, has been built at the Advanced Light Source. The purpose of this beamline is to address the myriad of problems in Materials Science and Physics that require submicron x-ray beams for structural characterization. Many such problems are found in the general area of thin films and nano-materials. For instance, the ability to characterize the orientation and strain state in individual grains of thin films allows us to measure structural changes at a very local level. These microstructural changes are influenced heavily by such parameters as deposition conditions and subsequent treatment. The accurate measurement of strain gradients at the micron and sub-micron level finds many applications ranging from the strain state under nano-indenters to gradients at crack tips. Undoubtedly many other applications will unfold in the future as we gain experience with the capabilities and limitations of this instrument. We have applied this technique to measure grain orientation and residual stress in single grains of pure Al interconnect lines and preliminary results on post-electromigration test experiments are presented. It is shown that measurements with this instrument can be used to resolve the complete stress tensor (six components) in a submicron volume inside a single grain of Al under a passivation layer with an

overall precision of about 20 MPa. The microstructure of passivated lines appears to be complex, with grains divided into identifiable subgrains and noticeable local variations of both tensile/compressive and shear stresses within single grains.
NTIS
Light Sources; Aluminum; Directivity; Microstructure; Passivity

20020028135 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Beam breakup calculations for the second axis of DARHT
Fawley, W. M.; Chen, Y. J.; Houck, T. L.; Aug. 20, 1999; 3p; In English
Report No.(s): DE2001-789091; LBNL-42440; No Copyright; Avail: Department of Energy Information Bridge
The accelerator for the second axis of the Dual Axis Radiographic Hydrodynamic Test (DARHT) facility will produce a 4-kA, 20-MeV, 2-(micro)s output electron beam with a design goal of less than 1000 (pi) mm-mrad normalized transverse emittance and less than 0.5-mm beam centroid motion. In order to meet this goal, the beam transport must have excellent optics and the beam breakup instability (BBU) must be limited in growth. Using a number of simulation codes such as AMOS and BREAKUP, we have modeled the transverse impedances of the DARHT-II accelerator cells and the electron beam response to different transverse excitations such as injector RF (radio frequency) noise, magnetic dipole fields arising from the 90-degree bend between the cathode stalk and insulator column, and downstream solenoid alignment errors. The very low Q ((approx)2) predicted for the most important TM dipole modes has prompted us to extend the BREAKUP code to be able to use the dipole wakefields calculated by AMOS in addition to the most usual discrete frequency BBU mode model. We present results for the predicted BBU growth and the empirical sensitivity to various machine parameters.
NTIS
Particle Accelerators; Transport Properties; Electron Beams; Hydrodynamics

20020028399 NASA Ames Research Center, Moffett Field, CA USA
Measurements of Band Intensities, Herman-Wallis Parameters, and Self-Broadening Line-Widths of the 30011 - 00001 and 30014 - 00001 Bands of CO2 at 6503 cm(exp -1) and 6076 cm(exp -1)
Giver, L. P., NASA Ames Research Center, USA; Brown, L. R., Jet Propulsion Lab., California Inst. of Tech., USA; Wattson, R. B., Stewart Radiance Lab., USA; Spencer, M. N., NASA Ames Research Center, USA; Chackerian, C., Jr., NASA Ames Research Center, USA; [1995]; 1p; In English; 50th International Symposium on Molecular Spectroscopy, 12-16 Jun. 1995, Columbus, OH, USA
Contract(s)/Grant(s): RTOP 154-50-80; No Copyright; Avail: Issuing Activity; Abstract Only
Rotationless band intensities and Herman-Wallis parameters are listed in HITRAN tabulations for several hundred CO2 overtone-combination bands. These parameters are based on laboratory measurements when available, and on DND calculations for the unmeasured bands. The DND calculations for the Fermi interacting nv(sub 1) + v(sub 3) polyads show the a(sub 2) Herman-Wallis parameter varying smoothly from a negative value for the first member of the polyad to a positive value for the final member. Measurements of the v(sub 1) + v(sub 3) dyad are consistent with the DND calculations for the a(sub 2) parameter, as are our recent measurements of the 4v(sub 1) + v(sub 3) pentad. However, the measurement-based values in the HITRAN tables for the 2v(sub 1) + v(sub 3) triad and the 3v(sub 1) + v(sub 3) tetrad do not support the DND calculated values for the a(sub 2) parameters. We therefore decided to make new measurements to improve some of these intensity parameters. With the McMath FTS at Kitt Peak National Observatory/National Solar Observatory we recorded several spectra of the. 4000 to 8000 cm(exp -1) region of pure CO2 at 0.011 cm(exp -1) resolution using the 6 meter White absorption cell. The signal/noise and absorbance of the first and fourth bands of the 3v(sub 1) + v(sub 3) tetrad of C-12O-16 were ideal on these spectra for measuring line intensities and broadening widths. Our selfbroadening results agree with the HITRAN parameterization, while our measurements of the rotationless band intensities are about 15% less than the HITRAN values. We find a negative value of a(sub 2) for the 30011-00001 band and a positive value for the 30014-00001 band, whereas the HITRAN values of a(sub 2) are positive for all four tetrad bands. Our a(sub 1) and a(sub 2) Herman-Wallis parameters are closer to DND calculated values than the 1992 HITRAN values for both the 30011-00001 and the 30014-00001 band.
Author
Carbon Dioxide; Spectral Bands

20020029853 Los Alamos National Lab., NM USA
Texture science and technology
Engler, O.; Bingert, J.; Nov. 01, 1999; 13p; In English
Report No.(s): DE2001-787262; LA-UR-99-2868; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This project is directed at advancing research and development in texture and anisotropy at Los Alamos. We are recognized as a national and international leader in texture and anisotropy research. This recognition is based on our understanding involving both quantitative texture analysis and the understanding and modeling of processes under which texture develops. In addition to these resources, we have available the full troika of texture measurement techniques, namely, x-ray, electron diffraction, and neutron diffraction. The goals of this project were (1) to increase the utilization of texture and anisotropy both within and without the Laboratory programmatic, basic, and industrial related efforts; (2) to seek to improve our texture measurement and modeling capabilities; and (3) to maintain our recognition as an international leader through basic research. These goals were accomplished through the formation of a coherent focus on texture directed through the CMS to coordinate texture efforts at the Laboratory as well as advancing the field in analysis, measurement and interpretation. The 'texture focus' has essentially four functions: One, to manage the physical measurement systems; two, to coordinate human resources at the lab; three, to serve as a resource for both external and internal users; and four, to advance the field of texture analysis at all levels and keep it at the forefront.
NTIS
Textures; Anisotropy; X Ray Diffraction; Human Resources; Neutron Diffraction; Quantitative Analysis

20020029857 Brookhaven National Lab., Upton, NY USA
Proceedings of RIKEN BNL Research Center, RHIC Spin Collaboration Meeting VI, Volume 36
Bland,; Saito,; Oct. 10, 2001; 199p; In English; RIKEN BNL Research Center, RHIC Spin Collaboration Meeting VI, Unknown
Report No.(s): DE2001-789238; BNL-52642-Vol-36; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The focus of the present meeting was to bring all involved in the RHIC Spin activities up-to-date on the progress of machine development, theory issues, and experimental issues. This meeting was right after the Program Advisory Committee (PAC) meeting and it started with the comments on the PAC discussion by Gerry Bunce, who was informed about the PAC deliberations by Tom Kirk. The PAC was fully supportive to complete the proposed spin program within the currently available budget for RHIC run 2 operations. Gerry further explained the expected luminosity to be S Ldt=0.5 pb-1 per week, reflecting the current machine status. The introductory session also had a talk from Werner Vogelsang the reviewed the progress in perturbative QCD theory focused on spin effects.
NTIS
Quantum Chromodynamics; Conferences; Luminosity; Reflection

20020030238 Argonne National Lab., IL USA
Critical exponents on inhomogenous ferromagnets
Berger, A.; Campillo, G.; Vivas, P.; Pearson, J. E.; Bader, S. D.; Nov. 16, 2001; 12p; In English
Report No.(s): DE2001-789727; ANL/MSD/CP-106153; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A method for the analysis of temperature and field dependent magnetization data near the Curie temperature Tc is devised, which allows the reliable determination of critical exponents even in strongly inhomogeneous ferromagnets. It is shown, both experimentally and theoretically, that the field-induced broadening of the ferromagnetic phase transition follows a power law with a characteristic critical exponent B-S where B and S are the conventional temperature and field dependent critical exponents of the magnetization. Experimental results on inhomogeneous La2/3Ca1/3MnO3 films yield critical exponents B=0.3682+0.0033 and S=4.76+0.32, even though the intrinsic Tc distribution width is larger than the field-induced effect.
NTIS
Ferromagnetism; Ferromagnetic Materials; Phase Transformations

20020030242 Fermi National Accelerator Lab., Batavia, IL USA
In celebration of the fixed target program with the Tevatron
Appel, J. A.; Dec. 28, 2001; 210p; In English
Report No.(s): DE2001-789802; FERMILAB-CONF-01/386; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Tevatron is the world's first large superconducting accelerator. With its construction, we gained the dual opportunities to advance the state of the art in accelerator technology with the machine itself and in particle physics with the experiments that became possible in a higher energy regime. In 1989 President Bush presented the National Medal of Technology to four Fermilab physicists; Helen Edwards, Dick Lundy, Rich Orr, and Alvin Tollestrup for their work in building the Tevatron. This award at the highest level possible for a government project is recognition of the many contributions from the Fermilab staff to the success

of the Tevatron project; from Bob Wilson at the beginning through all the scientists, engineers, and staff of what we now call the Beams and Technical divisions. They turned Bob's vision into a real accelerator.
NTIS
Targets; Particle Accelerators; Superconductivity

20020030243 Fermi National Accelerator Lab., Batavia, IL USA
Recent QCD results from CDF
Gorelov, I.; Dec. 28, 2001; 12p; In English
Report No.(s): DE2001-789801; FERMILAB-CONF-01/375-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Experimental results on QCD measurements obtained in recent analyses and based on data collected with CDF Detector from the Run 1b Tevatron running cycle are presented. The scope of the talk includes major QCD topics: a measurement of the strong coupling constant a8, extracted from inclusive jet spectra and the underlying event energy contribution to a jet cone. Another experimental object of QCD interest, prompt photon production, is also discussed and the updated measurements by CDF of the inclusive photon cross section at 630 GeV and 1800 Gev, and the comparison with NLO QCD predictions is presented.
NTIS
Quantum Chromodynamics; Hadrons; Particle Accelerators

20020030244 Fermi National Accelerator Lab., Batavia, IL USA
Supersymmetry searches at the Collider Detector at Fermilab
Tsybychev, D.; Dec. 28, 2001; 8p; In English
Report No.(s): DE2001-789800; FERMILAB-CONF-01/370-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This article presents the current experimental results of searches for Supersymmetry (SUSY) at the Collider Detector at Fermilab (CDF), using over 110 pb-1 of proton-antiproton collision data with /8=1800 GeV collected during the period 1992-1995. Since no signal was found, limits on the production of supersymmetric particles are derived. The prospects for supersymmetry searches at Run II of the Tevatron, that began in March 2001, are also discussed here.
NTIS
Supersymmetry; Particle Accelerators; Particle Collisions

20020030245 Brookhaven National Lab., Upton, NY USA
Physics at high luminosity muon colliders and a facility overview
Parsa,; Jul. 01, 2001; 11p; In English
Report No.(s): DE2001-789788; BNL-68851; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Physics potentials at future colliders including high luminosity u+u- colliders are discussed. Luminosity requirement estimates for Muon collider energies of interest (0.1 TeV to 100 TeV) are calculated. Schematics and an overview of Muon Collider facility concept are also included.
NTIS
Luminosity; Muons; Collisions

20020030737 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA
Analysis and Numerical Solution of an Integral Equation Method for Electromagnetic Scattering From a Cavity in a Ground Plane ***Final Report***
Howe, Eric T.; Sep. 2001; 81p; In English
Report No.(s): AD-A397330; AFIT/GAM/ENC/01S-1; No Copyright; Avail: Defense Technical Information Center (DTIC)

In this research the electromagnetic scattering of a plane wave from a two-dimensional cavity embedded in an infinite, perfectly conducting ground plane is investigated. The plane wave is assumed to be under transverse electric (TE) polarization with respect to the x-axis. The cavity may be empty or filled with an arbitrary homogeneous, loss material. A coupled set of scalar integral equations that govern the electromagnetic scattering is implemented. An approximate solution to the scalar integral equations is found via a Method of Moments (MoM) algorithm. The algorithm is implemented in a computer code, and approximations to the total magnetic field on the cavity surface and aperture as well as the nominal derivative of the total magnetic field on the cavity aperture are obtained. These fields are then used to calculate the two-dimensional monostable RCS (radar cross section) signatures of various test cavities. The numerical results from the algorithm are shown to agree well with the RCS signatures calculated by other well-known methods and published results. In addition to being accurate, the algorithm is very

computationally efficient. The process results in simply solving a relatively small, well-conditioned matrix system for each incident angle to produce the unknown fields.
DTIC
Electromagnetic Scattering; Numerical Analysis; Cavities; Integral Equations

20020032269 NASA Ames Research Center, Moffett Field, CA USA
Prototype Videodisk-Based Part-Task Thermal Imaging Trainer
Brickner, Michael S., PAMAM-Human Factors Engineering (1989) Ltd., Israel; Foyle, David C., NASA Ames Research Center, USA; [1995]; 1p; In English; Human Factors and Ergonomics Society, 9-13 Oct. 1995, San Diego, CA, USA; Sponsored by Human Factors and Ergonomics Society, USA
Contract(s)/Grant(s): RTOP 505-64-36; No Copyright; Avail: Issuing Activity; Abstract Only

Thermal images, or infrared images, are representations of the world based on heat, instead of visible light. Research has shown that the resulting thermal image results in perceptual differences leading to difficulties in interpretation (e.g., the determination of slope angle, concavity/convexity), or increased identification latencies. A joint research project between the United States (NASA and U.S. Army) and Israel (Ministry of Defense and Israel Air Force) has resulted in the development of a prototype part-task trainer for the acquisition of perceptual skills associated with thermal imaging usage. This prototype system is videodisk-based under computer control, using recordings of thermal images. A lesson section introduces declarative knowledge, in which the basic physics and heuristics of thermal imagery are taught. An exercise section teaches procedural knowledge, with the user viewing dynamic, actual imagery, with an interactive detection/location determination task. The general philosophy and design of the trainer will be demonstrated.
Author
Prototypes; Training Devices; Video Disks; Infrared Imagery

20020032321 Pennsylvania State Univ., Applied Research Lab., University Park, PA USA
Density of Axisymmetric Models of Closed In-Vacuo Prolate Spheroidal Shells ***Final Report, 1 May 1999-30 Jun. 2000***
Burroughs, Courtney B.; Jan. 22, 2002; 80p; In English
Contract(s)/Grant(s): N00014-99-1-0826
Report No.(s): AD-A398740; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The objective is to develop simple expressions for the modal density of prolate spheroidal shells applicable at frequencies above where modal overlap renders the need to identify locations of individual modes unnecessary. The effort presented here is limited to axisymmetric modes which present the greatest challenge. Axisymmetric modes involve the zeroth-order circumferential modal response where the effects of curvature are strongest because of the ring in-plane stresses. Non-axisymmetric mods will be influenced less by curvature which should simplify the development of simple expressions for modal density. Thus, if we can obtain good estimates of the modal density for higher-order axisymmetric modes, it is likely that we can also obtain good estimates for modal densities for all higher-order modes for a closed prolate spheroidal shell.
DTIC
Density (Mass/Volume); Modal Response; Curvature; Resonant Frequencies

20020032331 Ohio State Univ., Columbus, OH USA
Thermal Stability of NI(AL)/NI3AL Nanolayered Materials ***Final Report, 1 Jun. 1997-31 May 2001***
Anderson, Peter; Dec. 10, 2001; 23p; In English
Contract(s)/Grant(s): F49620-97-1-0439
Report No.(s): AD-A398778; AFRL-SR-BL-TR-02-0034; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this ASSERT-sponsored research is to study the morphological stability of Ni(Al)/Ni3Al nanoscale layered materials, as a function of interfacial orientational relationship, columnar grain dimensions, bilayer thickness, applied stress, and temperature. This final report describes our efforts over the course of the project to study the morphological stability of Ni(Al)/Ni3Al multilayer thin films that are heated to elevated temperature for prolonged periods. This area, when coupled with the objective of the parent project to optimize plastic strength in such materials, represent two critical design areas for nanoscale materials. This final report describes our efforts to both model the thermal stability of Ni(Al)/Ni3Al nanoscale layered materials and to conduct experiments to determine the temperature and time scales over which the layered morphology in such materials may break down.
DTIC
Intermetallics; Morphology; Thermal Stability; Thin Films; Thermal Stresses; Nanostructures (Devices)

20020032622 Colorado State Univ., Dept. of Physics, Fort Collins, CO USA

Microwave Magnetic Solitons in Ferrite Films - Physics and Devices for Radar, Electronic Countermeasures, and Surveillance ***Final Report, 1 Jul. 1998-31 Aug. 2001***

Patton, Carl E.; Dec. 10, 2001; 9p; In English

Contract(s)/Grant(s): DAAG55-98-1-0430

Report No.(s): AD-A398901; ARO-39051.1-PH; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The program has: (1) developed prototype microwave soliton delay line devices; (2) developed new device concepts based on the phase and velocity characteristics of solitons; and (3) applied Brillouin light scattering techniques to soliton characterization. New types of solitons, in the form of 'dark' surface wave solitons and backward volume wave solitons for in-plane magnetized yttrium iron garnet (YIG) films, were generated, detected, and modeled. Soliton formation, propagation, decay, reflection and collision properties were measured and modeled on the basis of the one dimensional nonlinear Schrodinger equation. Parametric pumping and feedback techniques were developed to amplify solitons and self generate eigenmode soliton signals. Brillouin light scattering (BLS) experiments were able to sample directly the wave vector make-up of the soliton signals. Soliton pumped spin waves were also observed and analyzed by the BLS technique. In addition, (1) time and space resolved capability has been added to the BLS system; (2) a new space and time resolved inductive magnetodynamic probe (IMP) technique has been developed and applied to the characterization of soliton delay line devices; and (3) a new frequency filtering technique has been used to self generate trains of both bright and dark solitons and produce a phase locked frequency comb.

DTIC

Microwaves; Solitary Waves

71
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.

20020027238 Stevens Inst. of Tech., Hoboken, NJ USA

Acquisition of Scanning Laser-Doppler Vibrometer System for Detection and Nondestructive Characterization of Interfaces ***Final Report, 31 Mar. 2000-30 Mar 2001***

Donskoy, Dimitri; Oct. 15, 2001; 2p; In English

Contract(s)/Grant(s): DAAD19-00-1-0096

Report No.(s): AD-A398486; ARO-40712.1-MS-RIP; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of this grant is to purchase a Scanning Laser-Doppler Vibrometer System PSV-300-H from Polytec PI. The system was acquired for the total cost of $166,450 of which $40,000 was provided by this DURIP grant. The rest of the funds came from research contract and matching contribution ($50,000) from Stevens Institute of Technology. The system was delivered in Spring of 2000 and was extensively utilized in ARO projects DAAG-98-1-0402 and DAAD19-00-1-0039 related to the Nonlinear Seismo-Acoustic Land Mine Detection and Discrimination Technique. Thus, the Scanning Laser-Doppler Vibrometer System became major measuring tool in both laboratory and field tests. The utilization of the system also contributed to education and outreach efforts. A number of graduate students had used the system while working for the ARO and other projects. The system was extensively used for numerous demonstration of the developed land mine detection technique to potential industrial partners, investors, as well as to groups of high school and undergraduate students.

DTIC

Lasers; Vibration Meters; Sound Detecting and Ranging

20020028398 NASA Ames Research Center, Moffett Field, CA USA

Sound For Animation and Virtual Reality

Hahn, James K., George Washington Univ., USA; Docter, Pete, Pixar Corp., USA; Foster, Scott H., Crystal River Engineering, USA; Mangini, Mark, Weddington Productions, USA; Myers, Tom, Skywalker Sound, USA; Wenzel, Elizabeth M., NASA Ames Research Center, USA; [1995]; 1p; In English; ACM SIGGRAPH 1995, 6-11 Aug. 1995, Los Angeles, CA, USA; Sponsored by Association for Computing Machinery, USA

Contract(s)/Grant(s): RTOP 505-64-13; RTOP 505-64-53; RTOP 199-06-12-32; No Copyright; Avail: Issuing Activity; Abstract Only

Sound is an integral part of the experience in computer animation and virtual reality. In this course, we will present some of the important technical issues in sound modeling, rendering, and synchronization as well as the "art" and business of sound that

are being applied in animations, feature films, and virtual reality. The central theme is to bring leading researchers and practitioners from various disciplines to share their experiences in this interdisciplinary field. The course will give the participants an understanding of the problems and techniques involved in producing and synchronizing sounds, sound effects, dialogue, and music. The problem spans a number of domains including computer animation and virtual reality. Since sound has been an integral part of animations and films much longer than for computer-related domains, we have much to learn from traditional animation and film production. By bringing leading researchers and practitioners from a wide variety of disciplines, the course seeks to give the audience a rich mixture of experiences. It is expected that the audience will be able to apply what they have learned from this course in their research or production.
Author
Acoustics; Computer Animation; Virtual Reality

20020029909 Naval Postgraduate School, Monterey, CA USA
Simulation of an Orthogonal Frequency Division Multiplexing Based Underwater Communication System Using a Physics Based Model for the Underwater Acoustic Sound Channel
Pittman, Gell T., III; Sep. 2001; 209p; In English
Report No.(s): AD-A397494; No Copyright; Avail: Defense Technical Information Center (DTIC)
The primary thrust of this thesis is the development of a computer-based simulation of an Orthogonal Frequency Division Multiplexing (OFDM) based underwater acoustic communication system. The product will support the testing and evaluation of various digital signal processing algorithms applicable to underwater acoustic communication systems using OFDM as well as the study of the effects of the acoustic channel and communication system factors on the key parameters of the system such as bit error rate, received signal to noise ratio, frequency band of employment and overall system bit rate. The underwater acoustic sound channel is modeled using a physics based parabolic equation approximation. The simulation models the key components in the transmitter and receiver that contribute to the overall performance of the system. The results of the thesis provide expected values for system performance in terms of bit rate, bit error rate and received SNR for given frequency bands and are validated through comparison to theoretically derived expectations and to ocean testing of OFDM underwater communication systems.
DTIC
Channels (Data Transmission); Computerized Simulation; Frequency Division Multiplexing; Signal Processing; Sound Transmission; Underwater Acoustics

20020030747 Boeing Co., Acoustics and Fluid Mechanics, Seattle, WA USA
Turbofan Duct Propagation Model
Lan, Justin H., Boeing Co., USA; December 2001; 71p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-97040; RTOP 706-81-12-01
Report No.(s): NASA/CR-2001-211245; NAS 1.26:211245; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
The CDUCT code utilizes a parabolic approximation to the convected Helmholtz equation in order to efficiently model acoustic propagation in acoustically treated, complex shaped ducts. The parabolic approximation solves one-way wave propagation with a marching method which neglects backwards reflected waves. The derivation of the parabolic approximation is presented. Several code validation cases are given. An acoustic lining design process for an example aft fan duct is discussed. It is noted that the method can efficiently model realistic three-dimension effects, acoustic lining, and flow within the computational capabilities of a typical computer workstation.
Author
Turbofans; Acoustic Propagation; Three Dimensional Models; Computer Techniques

20020030833 Washington Univ., Applied Physics Lab., Seattle, WA USA
An Acoustic Hemostasis Device for Advanced Trauma Care ***Final Report, 1 Mar. 1996-31 Oct. 2001***
Andrew, Marilee; Crum, Lawrence; Oct. 2001; 21p; In English; Original contains color images
Contract(s)/Grant(s): N00014-96-1-0630
Report No.(s): AD-A398720; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Research was conducted to develop acoustic homeostasis devices for advanced trauma care.
DTIC
Audio Equipment; Hemostatics

20020032315 Veridian, San Antonio, TX USA

Lack of Effects on Goal-Directed Behavior of High-Intensity Infrasound in a Resonant Reverberant Chamber ***Interim Report, Jan. 1999-Aug. 2000***

Cook, Michael C.; Sherry, Clifford F.; Brown, Caroll G.; Jauchem, James R.; Nov. 28, 2001; 45p; In English

Contract(s)/Grant(s): F41624-96-C-9009; AF Proj. 7757

Report No.(s): AD-A398702; AFRL-HE-BR-TR-2001-0154; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It has been hypothesized that high-intensity low-frequency sound (20-100 Hz) and infrasound (below 20 Hz) could incapacitate personnel located within buildings or underground facilities. A unique reverberant resonant chamber was designed and constructed of reinforced concrete, and incorporated a moveable wall to allow tuning to specific frequencies. Two minipigs (Sus scrofa) were trained to press a panel for food delivery. The tuning wall was positioned to create standing waves of maximal intensity at frequencies of 10, 12, 15, and 20 Hz. Four subwoofer speakers were used to produce sinusoidal signals at the tuned frequency of the chamber and at two and four times the tuned frequency. Over numerous trials, there was only a minimal impact on consummatory and escape behavior that rapidly dissipated with repeated exposures. In another series, two rhesus monkeys (Macaca mulatta) were trained on a continuous, compensatory-tracking task. The tuning wall was set for 10 Hz, with signals at 10 and 20 Hz. Subject behavior was not substantially affected. It seems unlikely that high-intensity acoustic energy 20-80 Hz, up to 145 dB can be used to facilitate hostage rescue. Due to the difficulty of obtaining high sound pressure levels in a large volume, further extensive experimentation is not suggested.

DTIC

Infrasonic Frequencies; Tuning; Walls; Resonant Vibration

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.

20020027275 Fermi National Accelerator Lab., Batavia, IL USA

Production and Decay of the Lambda(c) Charmed Baryon from Fermilab E791

Meadows, B.; Dec. 11, 2001; 4p; In English

Report No.(s): DE2001-789449; FERMILAB-CONF-01/350-E; No Copyright; Avail: Department of Energy Information Bridge

Results are presented for the 500 GeV/c pion production asymmetry and polarization of the Lambda(sub c) bar Lambda(sub c) charmed baryon from Fermilab experiment E791. An analysis of the decay to the p(bar K)pi final state is described. Resonant sub-channel fractions and phases are given and possible resonant effects in the low mass p(bar K) system discussed. Significant decay to Lambda(sub c) yields Delta(sup 2)K(sup -) establishes for the first time the importance of a W exchange mechanism in charmed baryon decay.

NTIS

Baryons; Charm (Particle Physics)

20020027277 Thomas Jefferson National Accelerator Facility, Newport News, VA USA

Novel Fat-Link Fermion Actions

Zanotti, J. M.; Bilson-Thompson, S.; Bonnet, F. D. R.; Coddington, P. D.; Leinweber, D. B.; Jul. 01, 2001; 6p; In English

Report No.(s): DE2001-789643; JLAB-THY-01-41; DOE/ER/40150-1971; ADP-01-54/T4; No Copyright; Avail: Department of Energy Information Bridge

The hadron mass spectrum is calculated in lattice QCD using a novel fat-link clover fermion action in which only the irrelevant operators in the fermion action are constructed using smeared links. The simulations are performed on a 16(carrot)lattice with a lattice spacing of a=0.125 fm. We compare actions with n=4 and 12 smearing sweeps with a smearing fraction of 0.7. The n=4 Fat-Link Irrelevant Clover (FLIC) action provides scaling which is superior to mean-field improvement, and offers advantages over nonperturbative 0(a) improvement.

NTIS

Fermions; Computation; Particle Mass; Mass Spectra

20020027278 Thomas Jefferson National Accelerator Facility, Newport News, VA USA

Baryon Resonances from a Novel Fat-Link Fermion Action

Melnitchouk, W.; Bilson-Thompson, S.; Bonnet, F. D. R.; Coddington, P. D.; Lee, F. X.; Jul. 01, 2001; 6p; In English

Report No.(s): DE2001-789642; JLAB-THY-01-40; DOE/ER/40150-1970; ADP-01-55/T4; No Copyright; Avail: Department of Energy Information Bridge

We present first results for masses of positive and negative parity excited baryons in lattice QCD using an O improved gluon action and a Fat Link Irrelevant Clover (FLIC) fermion action in which only the irrelevant operators are constructed with fat links. The results are in agreement with earlier calculations of N* resonances using improved actions and exhibit a clear mass splitting between the nucleon and its chiral partner, even for the Wilson fermion action. The results also indicate a splitting between the lowest states for the standard nucleon interpolating fields.

NTIS

Baryons; Quantum Chromodynamics; Baryon Resonance

20020027470 Oak Ridge National Lab., TN USA

Design and Characterization of High Power Targets for RIB Generation

Zhang, Y.; Jun. 29, 2001; 3p; In English

Report No.(s): DE2001-788681; P01-111177; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this article, thermal modeling techniques are used to simulate ISOL targets irradiated with high power proton beams. Beam scattering effects, nuclear reactions and beam power deposition distributions in the target were computed with the Monte Carlo simulation code, GEANT4. The power density information was subsequently used as input to the finite element thermal analysis code, ANSYS, for extracting temperature distribution information for a variety of target materials. The principal objective of the studies was to evaluate techniques for more uniformly distributing beam deposited heat over the volumes of targets to levels compatible with their irradiation with the highest practical primary-beam power, and to use the preferred technique to design high power ISOL targets. The results suggest that radiation cooling, in combination, with primary beam manipulation can be used to control temperatures in practically sized targets, to levels commensurate with irradiation with 1 GeV, 100 kW proton beams.

NTIS

Radioactivity; Ion Beams; Particle Accelerator Targets

20020027471 Oak Ridge National Lab., TN USA

Targets for High-Intensity Particle Production

Gabriel, T. A.; Jun. 19, 2001; 5p; In English

Report No.(s): DE2001-788680; P01-111131; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The high-powered target development efforts at ORNL for the Spallation Neutron Source and the muon collider/neutrino factory are discussed. Emphasis is given to the technology issues that present the greatest scientific challenges.

NTIS

Particle Accelerator Targets; Particle Beams; Particle Production

20020028401 NASA Ames Research Center, Moffett Field, CA USA

A FFT Method for the Quasiclassical Selection of Initial Ro-Vibrational States of Triatomic Molecules

Eaker, Charles W., NASA Ames Research Center, USA; Schwenke, David W., NASA Ames Research Center, USA; [1995]; 1p; In English

Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

This paper describes the use of an exact fast Fourier transform (FFT) method to prepare specified vibrational-rotational states of triatomic molecules. The method determines the Fourier coefficients needed to describe the coordinates and momenta of a vibrating-rotating triatomic molecule. Once the Fourier coefficients of a particular state are determined, it is possible to easily generate as many random sets of initial cartesian coordinates and momenta as desired. All the members of each set will correspond to the particular vibrational-rotational state selected. For example, in the case of the ground vibrational state of a non-rotating water molecule, the calculated actions of 100 sets of initial conditions produced actions within 0.001 h(bar) of the specified quantization values and energies within 5 cm(sup -1) of the semiclassical eigenvalue. The numerical procedure is straightforward for states in which all the fundamental frequencies are independent. However for states for which the fundamental frequencies become commensurate (resonance states), there are additional complications. In these cases it is necessary to determine a new set of ”fundamental” frequencies and to modify the quantization conditions. Once these adjustments are made, good results are

obtained for resonance states. The major problems are in labelling the large number of Fourier coefficients and the presence of regions of chaotic motion. Results are presented for the vibrational states of H2O and HCN and the ro-vibrational states of H2O. Author

Fast Fourier Transformations; Vibrational States; Rotational States; Triatomic Molecules

20020029279 Brookhaven National Lab., Upton, NY USA

Al alternative scheme for the neutrino factory with a high power proton driver

Ruggiero,; Jun. 30, 2001; 14p; In English

Report No.(s): DE2001-789490; BNL-68760; No Copyright; Avail: Department of Energy Information Bridge

We describe a scheme to produce an intense and collimated beam of neutrinos for the neutrino-oscillation experiment. The scheme feature is the presence of a Proton Driver that generates a proton beam at very large power (10mAx15GeV), considerably higher than that proposed elsewhere for this application. With this scheme, because of the high intensity of the proton beam, to produce neutrinos at the same required rates, it is sufficient to collect n and u mesons only around a small angle and at reduced momentum spreads. This eliminates the need for the difficult longitudinal manipulations of the protons and mesons, and of the ionization cooling that still needs to be demonstrated. It is also shown, at the end of the paper, that the Neutrino Factory here proposed can also be used as an injector for a 1x1 TeV2 u+-u- collider at large luminosity.

NTIS

Neutrinos; Proton Beams; Protons

20020029848 Los Alamos National Lab., NM USA

J/PSI and PST Suppression in P-A Collisions at 800 GeV/C

Leitch, M.; Lee, W.; Jul. 01, 1999; 5p; In English

Report No.(s): DE2001-785175; LA-UR-99-3572; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Strong suppression of the yield per nucleon of heavy vector mesons produced in heavy nuclei relative to light nuclei has been observed in proton and pion-nucleus collisions (1,2). Similar suppression has also been observed in heavy-ion collisions (3). The kinematic dependencies are strong, especially with Feynman-x (xF) and transverse momentum (pT), and broad coverage in these kinematic variables is essential towards unraveling the sources of the suppression. Since suppression of vector mesons in heavy-ion collisions is predicted to be an important signature for the formation of the quark-gluon plasma, it is important to understand all the mechanisms that already contribute in the absence of a quark-gluon plasma as seen in proton-nucleus collisions. Also important in understanding these mechanisms is to contrast suppression of vector meson production with similar studies of the Drell-Yan process and open charm production. In the Drell-Yan process shadowing, energy loss and multiple scattering in the initial state should play a role but no final-state effects should enter. However, open-charm production should be similar to vector meson production except that absorption mechanisms in the final state should be much weaker. Finally, comparisons of J/v and v suppression, especially at small or negative xF should yield information about the formation time of these resonances.

NTIS

Ionic Collisions; Plasmas (Physics); Vector Mesons; Energy Dissipation

20020029925 Los Alamos National Lab., NM USA

Intense electron beam disruption due to ion release from surface

Vermare, C.; Davis, H. A.; Jul. 24, 2001; 5p; In English

Report No.(s): DE2001-783251; LA-UR-01-3220; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A major concern for the DARHT second axis (2kA, 18.6 MeV, 2000 ns) is that ions or ionized neutrals released from solid surfaces (e.g., apertures, septum, dumps, and targets) by beam impact can be accelerated and trapped by the beam potential. This positive charge will be electrically attracted to the beam and could disrupt it. Possible release mechanisms include electron induced desorption of neutrals or ions, thermal desorption due to target heating and melting or vaporization of the solid target. to study this, experiments were performed on the DARHT first axis. Here, the beam, focused to a range of diameters, is transmitted through thin foils made of various materials. The time-dependent beam radial profile is measured downstream of the target. For low current density (depending on the material used), the downstream-beam profile is time invariant as expected. At higher current density, the downstream-beam radius changes during the pulse followed by transverse instability. Data, particle-in-cell simulations, and comparisons are presented.

NTIS

Linear Accelerators; Electron Beams; Current Density; Desorption; Foils (Materials)

20020030225 Brookhaven National Lab., Upton, NY USA

Micro-Bunching of the AGS Slow Extracted Beam for a Rare Kaon Decay Search

Glenn,; Sivertz,; Chiang,; Lazarus,; Koscielniak,; Jun. 18, 2001; 3p; In English

Report No.(s): DE2001-784217; BNL-68036; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The AGS Slow Extracted Beam (SEB) must be chopped with 250 ps bursts every 40 ns to permit time-of-flight (ToF) measurement of the secondary K(sup 0) beam. Standard techniques to produce this level of bunching would require excessive rf voltage, thus we have developed a 'Micro-Bunching'; technique of extracting the beam as it is forced between empty rf buckets. A specification of the required rf system will be given. Four-dimensional model simulations of particle dynamics for the planned rf and extraction systems will be shown. Simulations of previous tests along with the test measurements are also presented. Measurement of tight bunching requires dedicated instrumentation. The design of a detector system to measure bunch widths and the extinction factor between bunches will be given; considerations include the various particles produced and transported, timing precision and background.

NTIS

Bunching; Electric Potential; Extraction; Simulation

20020030247 Fermi National Accelerator Lab., Batavia, IL USA

Cost of dynamical quark simulations with improved staggered quarks

Gottlieb, S. A.; Dec. 28, 2001; 3p; In English

Report No.(s): DE2001-789810; FERMILAB-CONF-01/392-T; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The cost of dynamical quark simulations with improved staggered quarks is estimated based on current and planned running by the MILC collaboration. I find that a few 10s the Terflop years should be sufficient to calculate down to a lattice spacing of 0.045 fm.

NTIS

Quarks; Spacing

20020030354 Los Alamos National Lab., NM USA

Cross-Plane Resonance: A Mechanism for Very Large Amplitude Halo Formation

Qiang, J.; Hofmann, I.; Ryne, R. D.; Jun. 01, 2001; 4p; In English

Report No.(s): DE2001-783341; LA-UR-01-3304; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper we report on the possibility of very large amplitude halo formation due to a cross-plane resonance, based on a core/test-particle model. Previous analyses of halo formation in mismatched beams (which did not involve a coupling of the phase planes) have found that particles may be driven to amplitudes which are limited to typically three times the edge radius by a 2:1 parametric resonance. In the present paper, we systematically study the transverse halo as functions of the longitudinal-to-transverse focusing strength ratio and the longitudinal-to-transverse emittance ratio. We find that, in cases where the longitudinal focusing exceeds the transverse amplitude can be, in principle, unlimited. In this regime (in contrast to the usual in-plane resonance), the halo amplitude increases with a reduction of the space charge. This may have potential relevance to the future superconducting linac design where the longitudinal to transverse focusing ratio could be greater than one.

NTIS

Amplitudes; Superconducting Magnets; Linear Accelerators

20020032683 NASA Ames Research Center, Moffett Field, CA USA

Quantum Mechanical Determination of Potential Energy Surfaces for TiO and H2O

Langhoff, Stephen R., NASA Ames Research Center, USA; [1996]; 1p; In English; 178th IAU Symposium on Molecules in Astrophysics Probes and Processes, 1-5 Jul. 1996, Leiden, Netherlands; Sponsored by International Astronomical Union, Unknown

Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

We discuss current ab initio methods for determining potential energy surfaces, in relation to the TiO and H2O molecules, both of which make important contributions to the opacity of oxygen-rich stars. For the TiO molecule we discuss the determination of the radiative lifetimes of the excited states and band oscillator strengths for both the triplet and singlet band systems. While the theoretical radiative lifetimes for TiO agree well with recent measurements, the band oscillator strengths differ significantly from those currently employed in opacity calculations. For the H2O molecule we discuss the current results for the potential energy and dipole moment ground state surfaces generated at NASA Ames. We show that it is necessary to account for such effects

as core-valence Correlation energy to generate a PES of near spectroscopic accuracy. We also describe how we solve the ro-vibrational problem to obtain the line positions and intensities that are needed for opacity sampling.
Author
Quantum Mechanics; Potential Energy; Titanium Oxides; Water

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.

20020027274 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Beam Quality at Jefferson Lab
Spata, M. F.; Jan. 01, 2001; 7p; In English
Report No.(s): DE2001-789458; JLAB-ACO-01-05; DOE/ER/40150-1959; No Copyright; Avail: Department of Energy Information Bridge

The Continuous Electron Beam Accelerator Facility (CEBAF) at Jefferson Lab is a $600M CW electron accelerator in Newport News, Virginia. The machine is a recirculating, superconducting 5-pass linac initially commissioned for 4 GeV with a maximum beam power of 1 MW. With improvements in our RF cavity performance and an upgrade to magnet power supplies we are now capable of reliable operations at up to 5.7 GeV. We employ a three-laser photocathode gun to provide a CW electron beam with 80% polarization to three experimental endstations in currents ranging from 100 pA to 200 mA. Establishing clear criteria for beam quality and developing the means to verify and maintain beam quality is essential to a successful physics program.
NTIS
Electron Beams; Quality Control; Research Facilities; Particle Accelerators

20020027282 Brookhaven National Lab., Upton, NY USA
Scenario for a brookhaven neutrino super beam experiment
Diwan,; Kahn,; Palmer,; Stumer,; Parsa,; Jul. 01, 2001; 5p; In English
Report No.(s): DE2001-789380; BNL-68756; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This paper examines the feasibility of a long baseline neutrino beam facility based on a proposed upgrade to the AGS accelerator at Brookhaven National Laboratory. It assumes that the AGS is upgraded initially to a 1 MW proton driver and eventually to a 4 MW proton machine. This upgrade would provide a strong incentive for a long baseline low energy neutrino beam to study neutrino oscillations. In this paper we look at a possible long baseline experiment with a detector at Cornell, which is 350 km away from BNL.
NTIS
Particle Accelerators; Neutrino Beams

20020027288 Brookhaven National Lab., Upton, NY USA
Target Studies with BNL E951 at the AGS
Kirk,; Brown,; Fernow,; Finfrock,; Gassner,; Jun. 18, 2001; 6p; In English
Report No.(s): DE2001-789441; BNL-68732; No Copyright; Avail: Department of Energy Information Bridge

We report initial results of exposing low-Z solid and high-Z liquid targets to 150-ns, 4 x 10(exp 12) proton pulses with spot sizes on the order of 1 to 2 mm. The energy deposition density approached 100 J/g. Diagnostics included fiberoptic strain sensors on the solid target and high-speed photography of the liquid targets. This work is part of the research and development program of the Neutrino Factory and Muon Collider Collaboration.
NTIS
Targets; Neutrinos; Proton Beams

20020027469 Oak Ridge National Lab., TN USA
Oak Ridge 25URC Tandem Accelerator 2001 SNEAP Lab Report
Meigs, M. J.; Oct. 19, 2001; 2p; In English
Report No.(s): DE2001-788698; P01-112242; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Radioactive ion beam production and development at the Holifield Radioactive Ion Beam Facility (HRIBF) will be detailed in a talk at this conference. At the present time, the HRIBF is the only facility in the world capable of providing such beams.
NTIS
Particle Accelerators; Conferences

20020028935 Argonne National Lab., IL USA
High Energy Physics Division semiannual report of research activities, July 1, 2000-December 31, 2000
Norem, J.; Jul. 11, 2001; 89p; In English
Report No.(s): DE2001-789674; ANL-HEP-TR-01-50; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report describes the research conducted in the High Energy Physics Division of Argonne National Laboratory during the period of July 1, 2000-December 31,2000. Topics covered here include experimental and theoretical particle physics, advanced accelerator physics, detector development, and experimental facilities research. Lists of Division publications and colloquia are included.
NTIS
High Energy Interactions; Particle Accelerators

20020029257 Fermi National Accelerator Lab., Batavia, IL USA
Future Accelerators, Muon Colliders, and Neutrino Factories
Carrigan, R. A.; Dec. 19, 2001; 19p; In English
Report No.(s): DE2001-789645; FERMILAB-CONF-01/373-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Particle physics is driven by five great topics. Neutrino oscillations and masses are now at the fore. The standard model with extensions to supersymmetry and a Higgs to generate mass explains much of the field. The origins of CP violation are not understood. The possibility of extra dimensions has raised tantalizing new questions. A fifth topic lurking in the background is the possibility of something totally different. Many of the questions raised by these topics require powerful new accelerators. It is not an overstatement to say that for some of the issues, the accelerator is almost the experiment. Indeed some of the questions require machines beyond our present capability. As this volume attests, there are parts of the particle physics program that have been significantly advanced without the use of accelerators such as the subject of neutrino oscillations and many aspects of the particle-cosmology interface. At this stage in the development of physics, both approaches are needed and important. This chapter first reviews the status of the great accelerator facilities now in operation or coming on within the decade. Next, midrange possibilities are discussed including linear colliders with the adjunct possibility of gamma-gamma colliders, muon colliders, with precursor neutrino factories, and very large hadron colliders. Finally visionary possibilities are considered including plasma and laser accelerators.
NTIS
Accelerators; Cosmology; Neutrinos; Oscillations

20020029623 Los Alamos National Lab., NM USA
Test results of Beta = 0.64, 700 MHz, 5-cell elliptical cavities
Tajima, T.; Chan, K. C.; Sep. 10, 2001; 6p; In English
Report No.(s): DE2001-789264; LA-UR-01-5049; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Six 5-cell superconducting elliptical cavities have been fabricated at LANL and in industry and tested at LANL and TJNAF. The APT (Accelerator Production of Tritium) specification requires Qo>5x10-9 at an accelerating field of 5 MV/m. So far, the results of vertical tests have shown maximum accelerating fields of 12 MV/m peak surface field of 41 MV/m and 835 Oe and maximum Qo of 3.6x10-10 at E-acc=5 MV/m. The present limitations are available input power, field emission and quench. With a new 600 W amplifier and a mapping system for surface temperature and x-ray radiation, we are trying to identify and localize the emission/quench source(s) to further improve the cavity performance.
NTIS
Superconducting Cavity Resonators; Superconductivity; Surface Temperature; Field Emission

20020029634 Brookhaven National Lab., Upton, NY USA
ICOOL: A Tool for Muon Collider Simulations
Fernow,; Sep. 28, 2001; 8p; In English
Report No.(s): DE2001-788895; BNL-68689; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Current ideas for design neutrino factories (1,2) and muon colliders (3) require unique configurations of fields and materials to prepare the muon beam for acceleration. This so-called front end system must accomplish the goals of phase rotation, bunching and cooling. We have continued the development of a 3-D tracking code, ICOOL (4), for examining possible muon collider front end configurations. A system is described in terms of a series of longitudinal regions with associated material and field properties. The tracking takes place in a coordinate system that follows a reference orbit through the system. The codes takes into account decays and interactions of -50-500 MeV/c muons in matter. Material geometry regions include cylinders and wedges. A number of analytic models are provided for describing the field configurations. Simple diagnostics are built into the code, including calculation of emittances and correlations, longitudinal traces, histograms and scatter plots. A number of auxiliary codes can be used for pre-processing, post-processing and optimization.
NTIS
Correlation; Muons; Neutrinos; Emittance

20020029855 Brookhaven National Lab., Upton, NY USA
Accelerator physics issues for future electron ion colliders
Peggs,; Ben-Zvi,; Kewisch,; Murphy,; Jun. 18, 2001; 5p; In English
Report No.(s): DE2001-789489; BNL-68754; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Interest continues to grow in the physics of collisions between electrons and heavy ions, and between polarized electrons and polarized protons (1,2,3). Table 1 compares the parameters of some machine under discussion. DESY has begun to explore the possibility of upgrading the existing HERA-p ring to store heavy ions, in order to collide them with electrons (or positrons) in the HERA-e ring, or from TESLA (4). An upgrade to store polarized protons in the HERA-p ring is also under discussion (1). BNL is considering adding polarized electrons to the RHIC repertoire, which already includes heavy and light ions, and polarized protons. The authors of this paper have made a first pass analysis of the 'eRHIC' possibility (5). MIT-BATES is also considering electron ion collider designs (6).
NTIS
Positrons; Heavy Ions; Collisions; Storage Rings (Particle Accelerators)

20020029858 Brookhaven National Lab., Upton, NY USA
Short range wakefield in a flat pillbox cavity generated by a sub-relativistic beam bunch
Wang,; Palmer,; Gallardo,; Jun. 18, 2001; 4p; In English
Report No.(s): DE2001-788897; BNL-68563-01/10-Rev; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The short-range wakefield between two parallel conducting plates generated by a sub-relativistic beam bunch has been solved analytically by image charge method in time domain. Comparing with traditional modal analysis in frequency domain, this algorithm simplifies mathematics and reveals great details of physics in electromagnetic field generation, propagation, reflection and causality. The calculated results have an excellent agreement with MAFIA and ABCI simulations in all range of beam velocities.
NTIS
Beamforming; Cavities; Frequencies; Parallel Plates; Simulation

20020029920 Los Alamos National Lab., NM USA
Studying the role of nuclear structure effects in neutron-induced reactions using geanie at lansce
Bernstein, L.; Archer, D.; May 01, 2001; 12p; In English
Report No.(s): DE2001-780712; LA-UR-01-2540; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The GEANIE (Germanium Array for Neutron Induced Excitations) spectrometer at the LANSCE/WNR (Los Alamos Neutron Science Center/Weapons Neutron Research) 800 MeV spallation neutron source provides a unique tool for studying reaction dynamics for incident particle energies up to and beyond 250 MeV/amu. In this paper we will discuss several of the recent results from GEANIE and their implications for reaction dynamics modeling.
NTIS
Nuclear Structure; Spectrometers; Germanium; Neutron Sources; Neutron Spectrometers

20020029921 Los Alamos National Lab., NM USA
Diagnostics plate for sns linac commissioning
Plum, M.; Garnett, R.; Meyer, R.; Shafer, R.; Jun. 01, 2001; 4p; In English
Report No.(s): DE2001-783146; LA-UR-01-2945; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A Diagnostics Plate is being assembled as part of the linac commissioning plan for the Oak Ridge National Laboratory Spallation Neutron Source (SNS). The D-Plate will be positioned directly after the first Drift Tube Linac (DTL) tank, where the H beam energy will be 7.5 MeV. A full suite of beam diagnostic instrumentation is planned, including profile, current, phase, energy, and emittance measurements. The D-Plate is designed to operate up to the full duty factor of the linac, or up to 16-kW beam power. Until the spallation neutron target is completed several years later, this will be the last time the facility can be operated at full current and duty cycle.
NTIS
Linear Accelerators; Neutron Sources; Targets

20020029927 Los Alamos National Lab., NM USA
Electron proton two-stream instability at the proton storage ring(psr)
Macek, R.; Bowman, A.; Jun. 01, 2001; 6p; In English
Report No.(s): DE2001-783161; LA-UR-01-3034; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A strong, fast, transverse instability has long been observed at the Los Alamos Proton Storage Ring (PSR) where it is a limiting factor on peak intensity. Most of the available evidence, based on measurements of the unstable proton beam motion, is consistent with an electron-proton two-stream instability. The need for higher beam intensity at PSR (1) and for future high-intensity, proton drivers has motivated a multi-lab collaboration (LANL, ANL, FNAL, LBNL, BNL, ORNL, and PPPL) to coordinate research on the causes, dynamics and cures for this instability. Important characteristics of the electron cloud were recently measured with retarding field electron analyzers and various collection electrodes. Suppression of the electron cloud formation by TiN coatings has confirmed the importance of secondary emission processes in its generation. New tests of potential controls included dual harmonic rf, damping by higher order multipoles, damping by X, Y coupling and the use of inductive inserts to compensate longitudinal space charge forces. With these controls and higher rf voltage the PSR has accumulated stable beam intensity up to 9.7 uC/pulse (6x1013 protons), which is a 60% increase over the previous maximum.
NTIS
Storage Rings (Particle Accelerators); Protons; Secondary Emission; Electric Potential

20020029928 Los Alamos National Lab., NM USA
Low-Energy Demonstration Accelerator (LEDA) Test Results and Plans
Smith, H. V.; Schneider, J. D.; Sheffield, R.; Jun. 01, 2001; 4p; In English
Report No.(s): DE2001-783150; LA-UR-01-2975; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The LEDA 75-keV injector and 6.7-MeV RFQ have been tested with pulsed and cw proton beam currents up to 100 mA. Several LINAC2000 papers give the results of those measurements. A follow-on experiment, to intentionally introduce and measure beam halo on the RFQ output beam, is reported in several papers at this conference (PAC2001). In this paper we summarize the LEDA RFQ commissioning results and the beam-halo measurements and we discuss future test plans for the high-current, high-average-power rf structures test bed.
NTIS
Beam Injection; Accelerators; Beam Currents; High Current; Continuous Radiation

20020030074 Brookhaven National Lab., Upton, NY USA
Results from luminosity scans during the rhic 2000 run
Drees,; Xu,; Jun. 18, 2001; 3p; In English
Report No.(s): DE2001-784218; BNL-67961; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
During the year 2000 run a total of eight beam scans (Vernier Scans) were performed at various interaction points (IF) at RHIC. During a Vernier Scan the experimental collision rates are recorded while the beams are stepwise scanned across each other. Vernier Scans yield transverse beam sizes as well as maximum luminosity and thus the absolute cross section, which with the limited data from the 2000 run we measured to be (sigma) = 8.9 (+-) 0.3 barn at ((radical)s(sub NN)) = 130 GeV. Also, Vernier Scans permit performance studies of the beam orbit control and local coupling.
NTIS
Scanners; Collision Rates

20020030075 Brookhaven National Lab., Upton, NY USA
Schottky measurements during rhic 2000
Cameron,; Cupolo,; Degen,; Hammons,; Kesselman,; Jun. 18, 2001; 3p; In English
Report No.(s): DE2001-784219; BNL-67988; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The 2GHz Schottky system was a powerful diagnostic during RHIC 2000 commissioning. A continuous monitor without beam excitation, it provided betatron tune, chromaticity, momentum spread relative emittance, and synchrotron tune. It was particularly useful during transition studies. In addition, a BPM was resonated at 230MHz for Schottky measurements.
NTIS
Betatrons; Emittance; Synchrotrons; Work Functions

20020030076 Brookhaven National Lab., Upton, NY USA
Tune feedback at RHIC
Cameron,; Cerniglia,; Connolly,; Cupolo,; Dawson,; Jun. 18, 2001; 3p; In English
Report No.(s): DE2001-784220; BNL-67989; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Preliminary phase-locked loop betatron tune measurement results were obtained during RHIC 2000 with a resonant Beam Position Monitor. These results suggested the possibility of incorporating PLL tune measurement into a tune feedback system for RHIC 2001. Tune feedback is useful in a superconducting accelerator, where the machine cycle time is long and inefficient acceleration due to resonance crossing is not comfortably tolerated. This is particularly true with the higher beam intensities planned for RHIC 2001. We present descriptions of a PLL tune measurement system implemented in the DSP/FPGA environment of a RHIC BPM electronics module and the feedback system into which the measurement is incorporated to regulate tune. In addition, we present results from the commissioning of this system during RHIC 2001.
NTIS
Tuning; Betatrons; Field-Programmable Gate Arrays; Phase Locked Systems; Beams (Radiation); Superconductivity

20020030080 Los Alamos National Lab., NM USA
Benchmark calculations for the diluted highly enriched uranium (heu) and aluminum experiment
Loaiza, D. J.; Sanchez, R. G.; Jun. 01, 2001; 6p; In English
Report No.(s): DE2001-783305; LA-UR-01-3146; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The HEU-Al experiment was performed using the Planet universal critical assembly at Los Alamos Critical Experiment Facility (LACEF) in Los Alamos National Laboratory. This experiment consisted of placing HEU foils interspersed with aluminum plates in a column stack. These uranium foils were moderated and reflected by polyethylene square plates. This experiment was performed to measure the prompt neutron decay constants in uranium systems diluted by matrix materials. This experimental set-up yielded a Al/235U ratio of 60:1. The experimental k-eff was 1.001 and the modeled MCNP k-eff was 1.0016+0.0004. This report summarizes the benchmark calculations performed to validate the experiment.
NTIS
Aluminum; Zero Power Reactors; Uranium; Neutron Decay; Critical Experiments

20020030103 Los Alamos National Lab., NM USA
Characterizing proton beam of 6.7 mev leda rfq by fitting wire-scanner profiles to 3-d nonlinear simulations
Gilpatrick, J. D.; Lysenko, W. P.; Jun. 01, 2001; 4p; In English
Report No.(s): DE2001-783282; LA-UR-01-3139; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Quadrupole scans were used to characterize the transverse beam of the LEDA RFQ. The original scan data, obtained when the HEBT was installed immediately downstream of the RFQ, were reanalyzed by fitting to the 3-D nonlinear simulation code IMPACT. All the data in the measured profiles at the wire scanner were used not just the rms widths. The measured and simulated profiles still have differences in their shapes that have not been explained. An improved model is required to get better fits and may result in more accurate emittance measurements.
NTIS
Proton Beams; Linear Accelerators; Quadrupoles; Emittance

20020030235 Argonne National Lab., IL USA
Systemic analysis, mapping, modeling, and simulation of the advanced accelerator applications program
Guan, Y.; Laidler, J. J.; Morman, J. A.; Nov. 27, 2001; 8p; In English
Report No.(s): DE2001-789732; ANL/RAE/CP-106203; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Advanced chemical separations methods envisioned for use in the Department of Energy Advanced Accelerator Applications (AAA) program have been studied using the Systemic Analysis, Mapping, Modeling, and Simulation (SAMMS) method. This integrated and systematic method considers all aspects of the studied process as one dynamic and inter-dependent system. This particular study focuses on two subjects: the chemical separation processes for treating spent nuclear fuel, and the associated

non-proliferation implications of such processing. Two levels of chemical separation models are developed: level 1 models treat the chemical process stages by groups; and level 2 models depict the details of each process stage. Models to estimate the proliferation risks based on proliferation barrier assessment are also developed. This paper describes the research conducted for the single-stratum design in the AAA program. Further research conducted for the multi-strata designs will be presented later. The method and models described in this paper can help in the design of optimized processes that fulfill the chemical separation process specifications and non-proliferation requirements.
NTIS
Accelerators; Systems Analysis; Chemical Reactions; Spent Fuels

20020030310 Brookhaven National Lab., Upton, NY USA
Continuous extracted beam in the ags fast external beam line
Glenn,; Tsoupas,; Brown,; Biryukov,; Jun. 18, 2001; 3p; In English
Report No.(s): DE2001-784216; BNL-67980; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A method to split off a few percent of the 6 x 10(sup 13) AGS beam delivered to the Slow External Beam (SEB) lines and send it down the Fast External Beam line (FEB) has been developed. The mission is to feed a counter experiment off the FEB that directly measures the neutrino mass using the muon storage ring. The use of normal thin septum splitters would have an excessive loss overhead and been optically difficult. The AGS Slow Extraction uses a third integer resonance with sextuple strength so the resonance width is a few percent of the beam width. This results in a low density tail which will be clipped by a bent crystal and deflected into the FEB channel. This clipping off of the tail should reduce losses in the SEB transport line. Details of modeled orbits, particle distribution and extraction trajectories into and out off the crystal will be given.
NTIS
Storage Rings (Particle Accelerators); Extraction; Neutrinos; Muons

20020030333 Brookhaven National Lab., Upton, NY USA
Beam parameters of the ags synchrotron during fast beam extraction at the location of the ags kicker
Tsoupas,; Ahrens,; Glenn,; Van Asselt,; Brennan,; Jun. 18, 2001; 3p; In English
Report No.(s): DE2001-784214; BNL-67953; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The longitudinal requirements for the AGS to RHIC transfer process requires a precise control of the radius and frequency of the circulating bunches in the AGS just before the bunch extraction from the AGS and subsequent. injection into RHIC via the ATR transfer line. In addition the transverse beam parameters in the AGS at the location of the Extraction kicker define the 'beam-matching' between the ATR line and RHIC. In this paper we present theoretical and experimental results related to the longitudinal and transverse parameters of the AGS.
NTIS
Extraction; Synchrotrons; Radii; Circulation

20020030357 Los Alamos National Lab., NM USA
Design considerations of fast kicker systems for high intensity proton accelerators
Zhang, W.; Sandberg, J.; Jun. 01, 2001; 5p; In English
Report No.(s): DE2001-783264; LA-UR-01-3252; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In this paper, we discuss the specific issues related to the design of the Fast Kicker Systems for high intensity proton accelerators. to address these issues in the preliminary design stage can be critical since the fast kicker systems affect the machine lattice structure and overall design parameters. Main topics include system architecture, design strategy, beam current coupling, grounding, end user cost vs. system cost, reliability, redundancy and flexibility. Operating experience with the Alternating Gradient Synchrotron injection and extraction kicker systems at Brookhaven National Laboratory and their future upgrade is presented. Additionally, new conceptual designs of the extraction kicker for the Spallation Neutron Source at Oak Ridge and the Advanced Hydrotest Facility at Los Alamos are discussed.
NTIS
Synchrotrons; Design Analysis; Beam Currents; Neutron Sources; Flexibility

20020030358 Los Alamos National Lab., NM USA
Comparison between an in-house vs. a commercial control system for beam line control
Pieck, M.; Kasemir, K. U.; Jun. 01, 2001; 4p; In English
Report No.(s): DE2001-783273; LA-UR-01-3181; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Two independent magnet and vacuum control systems were implemented in the Low-Energy Demonstration Accelerator (LEDA) facility. The first one, for the High-Energy Beam Transport (HEBT) in context of the Accelerator Production of Tritium (APT) project, used the in-house Experimental Physics and Industrial Control System (EPICS). The second one, for the high-power proton beam-halo experiment (3) (HALO-Channel) as an extension to the existing accelerator, is based on commercial products (National Instruments, LabVIEW). This paper will evaluate our experience during implementation, operation, and maintenance of these systems. It will include a discussion of various problems encountered and solutions implemented.
NTIS
Linear Accelerators; Proton Beams; Control

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OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20020027241 Illinois Univ., Beckman Inst., Urbana, IL USA
Interferometric Digital Imaging ***Final Report***
Brady, David J.; Munsoon, David C.; Michielssen, Eric; Dec. 18, 2001; 218p; In English
Contract(s)/Grant(s): DAAG55-98-1-0039
Report No.(s): AD-A398472; ARO-38310.6-PH; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche
The Illinois Interferometric Imaging Initiative (4Is) demonstrated that aspects of conventional focal imaging, coherence sensing, holography, spectroscopy and tomography could be integrated to obtain revolutionary new functionalities in digital imaging systems. Novel functions demonstrated included multidimensional imaging, phase and polarization sensitive imaging, simultaneous spatial and spectral analysis and nonlocal basis vector sampling. The 4Is initiative provides strong evidence that the ”pixels-to-pupils ratio” problem of distributed sensor systems can be addressed by designing sensors to detect target specific physical primitives. These primitives can be adaptively or interactively identified and isolated. Initiatives to develop scan-free 3D microscopes, spatio-spectral biosensors, advanced tracking telescopes and cooperative sensor arrays have resulted from the 4Is initiative.
DTIC
Digital Systems; Systems Integration; Imaging Techniques; Interferometry

20020028175 Wisconsin Univ., Dept. of Chemical Engineering, Madison, WI USA
Defect Engineering and Defect Complexes in Compound Semiconductors Alloys ***Final Report, 15 Sep. 1998-14 Dec. 2001***
Kuech, Thomas F.; Dec. 2001; 13p; In English
Contract(s)/Grant(s): DAAG55-98-1-0485
Report No.(s): AD-A398372; FR144-HG41; ARO-38940.2-MS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This grant investigated various aspects of defect-engineered compound semiconductor films and heterostructures. The research studied in detail the impact of intentional defect introduction into semiconductor heterojunction device structures. The impact of intentional defect introduction is on the formation, properties and structure of heterointerfaces is of particular interest in these studies. We continued the development of submicron probes to obtain highly localized information on electronic structure and optical properties, coupled with the topology of the film using Near Field Scanning Optical Microscopy as a photoluminescence probe and as a scanning photoreflectance probe. This grant also looked at the means to use localized stress to alter the motion of dislocation developed at a lattice-mismatched heterointerface.
DTIC
Semiconducting Films; Defects; Electronic Structure

20020028177 State Univ. of New York, Stony Brook, NY USA
Dark States and deBroglie Wave Optics ***Final Report, 15 Jun. 1997-14 Jul. 2001***
Metcalf, Harold; Jul. 2001; 15p; In English
Contract(s)/Grant(s): DAAG55-97-1-0332
Report No.(s): AD-A398376; ARO-P-36413.2-PH; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The main thrust of this project is experiments with metastable helium atoms (He*) in dark states, entangled states, and other kinds of superpositions of motional and internal states. Also, the control of their motion by strong optical forces, exploiting non-monochromatic light. During the grant period we have made considerable progress toward these goals. Several experiments have worked, five doctoral theses have been completed, and a number of papers and conference proceedings have resulted.
DTIC
Metastable Atoms; Helium Atoms

20020029294 Sandia National Labs., Albuquerque, NM USA
Functional Materials for Microsystems: Smart Self-Assembled Photochromic Films ***Final Report***
Burns, A. R.; Sasaki, D. Y.; Carpick, R. W.; Shelnutt, J. A.; Brinker, C. J.; Nov. 01, 2001; 59p; In English
Report No.(s): DE2001-789579; SAND2001-3397; No Copyright; Avail: Department of Energy Information Bridge
This project set out to scientifically tailor 'smart' interfacial films and 3-D composite nanostructures to exhibit photochromic responses to specific, highly-localized chemical and/or mechanical stimuli, and to integrate them into optical microsystems. The project involved the design of functionalized chromophoric self-assembled materials that possessed intense and environmentally-sensitive optical properties (absorbance, fluorescence) enabling their use as detectors of specific stimuli and transducers when interfaced with optical probes. The conjugated polymer polydiacetylene (PDA) proved to be the most promising material in many respects, although it had some drawbacks concerning reversibility. Throughout this work we used multi-task screening probes (AFM, NSOM), offering simultaneous optical and interfacial force capabilities, to actuate and characterize the PDA with localized and specific interactions for detailed characterization of physical mechanisms and parameters. In addition to forming high quality mono-, bi-, and tri-layers of PDA via Langmuir-Blodgett deposition, we were successful in using the diacetylene monomer precursor as a surfactant that directed the self-assembly of an ordered, mesostructured inorganic host matrix. Remarkably, the diacetylene was polymerized in the matrix, thus providing a PDA-silica composite. The inorganic matrix serves as a perm-selective barrier to chemical and biological agents and provides structural support for improved material durability in microsystems. Our original goal was to use the composite films as a direct interface with microscale devices as optical elements (e.g., intracavity mirrors, diffraction gratings), taking advantage of the very high sensitivity of device performance to real-time dielectric changes in the films. However, our optical physics colleagues (M. Crawford and S. Kemme) were unsuccessful in these efforts, mainly due to the poor optical quality of the composite films.
NTIS
Three Dimensional Composites; Langmuir-Blodgett Films; Nanostructures (Devices); Optical Properties

20020029618 Los Alamos National Lab., NM USA
Ultrafast measurement of the optical properties of shocked nickel and laser heated gold
Funk, D. J.; Moore, D. S.; Jun. 01, 2001; 5p; In English
Report No.(s): DE2001-783220; LA-UR-01-3482; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We have used high-resolution Frequency Domain Interferometry (FDI) to make the first ultrafast measurement of shock-induced changes in the optical properties of thin nickel (approximately 500 nm) targets. Data taken at several angels of incidence allowed the separation of optical effects from material motion, yielding an effective complex index for the shocked material. In contrast to our previous studies of aluminum, measurements with an 800 nm probe wavelength found a phase shift attributable to optical property changes with the same sign as that due to surface motion, during an 11.5 Gpa shock breakout. A similar experiment was attempted with thin gold films (approximately 180 nm) using Ultrafast Spatial Interferometry (USI). However, since the electron-phonon coupling in gold is extremely weak, a shock is observed as it 'forms'. Ballistic electrons and electron-electron equilibrium cause fast heating of the electrons in the entire thickness of the thin film, followed by lattice excitation through electron-phonon coupling, eventually leading to melt and frustrated thermal expansion yielding the observed surface motion. We suggest that these experiments offer a new path for observation of phase changes or for temperature measurements, by allowing a determination of the complex index under dynamic loading conditions and comparing the measured values to those obtained under static conditions.
NTIS
Thin Films; Nickel; Optical Properties

20020030272 Naval Postgraduate School, Monterey, CA USA
Modeling Jamming Effects on Rolling Airframe Missile
Yen, Chia-Chun; Sep. 2001; 48p; In English
Report No.(s): AD-A397650; No Copyright; Avail: Defense Technical Information Center (DTIC)

Development of countermeasures against infrared and optical guided missiles is enhanced by an ability to quantify the effects of the countermeasure. Analysts must be capable of accurately determining the attitude of the missile throughout its flight. This thesis describes the use of microelectronic-miniature (MEM) technologies to measure the strap down rates experienced by a rolling airframe missile and the model required to effectively determine the missile's attitude during its flight. The Tokin America CG-16D rate sensors and the Honeywell, SSEC, HMC 1002 roll sensor were used in an inertial measurement unit (IMU). The size of the IMU is small and rugged enough to be installed in a small diameter missile. A SIMULINK model is presented that performs the tasks of demodulating the sensors, performing coordinate transformation, and providing animation of the missile attitude for analysis. The model was evaluated for its ability to accurately determine the attitude of the missile based on input from the IMU packages. Sensor data was obtained from testing performed on a CARCO table flight motion simulator, and compared to the ground truth data provided by the CARCO table. Previous research had proved that this model worked for slow-spinning missile (5 Hz in roll). This thesis research expands that research to a fast spinning missile (15 Hz in roll). Through testing, the model was capable of providing solutions within the 2 degrees RMS requirement.
DTIC
Airframes; Jamming; Microelectronics; Missile Design; Miniaturization; Roll; Mathematical Models

20020030284 Air Command and Staff Coll., Maxwell AFB, AL USA
Smoke and Obscurant Operations in a Joint Environment
Butler, Brian A.; Apr. 1998; 42p; In English
Report No.(s): AD-A398331; AU/ACSC/042/1998-04; No Copyright; Avail: Defense Technical Information Center (DTIC)

Throughout this century, smoke and obscurant operations played a major role in military operations. American Forces found many uses for this combat multiplier. From smoke pots and smoke generators to smoke rounds projected from mortar tubes, smoke and obscurant operations significantly affected battlefield conditions. Smoke and obscurant operations are not new to US military operations. In fact, they played a key role in the protection of military assets throughout this century. The USA Army experimented with smoke and obscurants during World War I, then used them extensively during World War II. Additionally, Navy and Air Force personnel used smoke and obscurants across the spectrum of military operations. The Air Force used smoke to mark targets and control flights in mid-air, while the Navy used smoke to conceal vessels at sea and protect them from air attacks. Examining operations during several conflicts throughout our history shows that smoke operations supported river crossings, obstacle emplacements, screened troop movements, and concealed towns and cities during bombing raids. The focus of this paper is on smoke and obscurants as a combat multiplier in Joint Operations. Understanding the historical and current uses of smoke and obscurants by the different services is the basis for determining future requirements for smoke and obscurant operations in the 21st Century.
DTIC
Military Operations; Armed Forces (USA); Ammunition; Smoke

20020030824 Academy of Sciences of the Ukraine, Inst. of Physics of Metals, Kiev Ukraine
Optical Vortices: Understanding and Assessment ***Final Report, 1 Oct. 2000-7 Nov. 2001***
Soskin, Marat S.; Oct. 2001; 78p; In English; Original contains color images
Report No.(s): AD-A398180; P-051; EOARD-STCU 00-8002; No Copyright; Avail: Defense Technical Information Center (DTIC)

This report results from a contract tasking Institute of Physics, National Academy of Sciences of Ukraine. Optical vortices (OVs) are unique optical objects, existing around phase singularities in electromagnetic fields. Their unique properties allow possible applications that include "optical traps" for cold atoms, OV optical tweezers for microparticles, data transmission through optical communications systems, correction of phase distortions in an adaptive optical system, testing a turbulent atmosphere, etc. In this project the contractor will conduct theoretical studies and experiments to 1) better define the quantum properties of OV; 2) explore OV optical tweezers; and 3) examine vortex sensors with extremely high sensitivity.
DTIC
Vortices; Adaptive Optics; Optical Communication

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20020029258 Fermi National Accelerator Lab., Batavia, IL USA
Ultra high-gradient energy loss by a pulsed electron beam in a plasma
Barov, N.; Dec. 19, 2001; 3p; In English
Report No.(s): DE2001-789641; FERMILAB-CONF-01/365; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The plasma wake-field mechanism can be used to couple energy at a high rate from a bunched electron beam into a plasma wave. We will present results from the Fermilab A0 facility where a beam with an initial energy of 14 MeV passes through the plasma to emerge with a much broader energy spread, spanning from a low of 3 MeV to a high of over 20 MeV. Over the 8 cm length of the 10-14 cm-3 plasma, this implies a 140 MeV/m deceleration and 72 MeV/m acceleration gradient.
NTIS
Accelerators; Electron Beams; Plasmas (Physics)

20020029849 Los Alamos National Lab., NM USA
Alternative fuels for ICF targets
Hoffer, J. K.; Nov. 01, 1999; 6p; In English
Report No.(s): DE2001-787331; LA-UR-99-5852; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The first observation of the beta-layering phenomenon showed that it was possible to fabricate inertial confinement fusion (ICF) targets having an outer ablating shell surrounding a symmetric solid layer of DT fusion fuel. The sensitivity of fusion yield to the internal DT ice roughness is a function of many factors, one of which is the relatively low density of solid DT (0.25 g/cm3), leading to a high Atwood number for the ablator/fuel interface. This is one of the issues that has led us to consider other DT-based fuels having higher densities than pure DT but still capable of being automatically redistributed into a uniform layer by beta-layering. The two principle conditions for beta-layering redistribution, self-heating and a moderately high vapor pressure, can be found in only a few other systems. But by concentrating on hydrides of elements in the second row of the periodic chart, we can find materials which should beta-layer and which might be good candidates for fusion fuel. We exclude lithium hydride and beryllium hydride, because these materials are solids at room temperature where an automatic redistribution technique such as beta-layering would not be necessary. Therefore we begin with boron and consider the following materials: diborane: B2(DT)3 (or B2D3T3); methane: C(DT)2 (or CD2T2); ammonia: N(DT)3/2 (i.e., 0.5-NDT2+0.5-ND2T); water: DT0, and hydrofluoric acid: (DT)1/2F (i.e.., 0.5-DF+0.5-TF).
NTIS
Targets; Fuels; Beryllium Hydrides; High Pressure; Ablative Materials

20020029922 Los Alamos National Lab., NM USA
Atlas facility fabrication and assembly
Ballard, E.; Cochrane, J.; May 01, 2001; 5p; In English
Report No.(s): DE2001-780521; LA-UR-01-2369; No Copyright; Avail: Department of Energy Information Bridge

Atlas is a pulsed-power facility recently completed at Los Alamos National Laboratory to drive hydrodynamic experiments. This new generation pulsed-power machine consists of a radial array of 24, 240-kV Marx modules and transmission lines supplying current to the load region at the machine center. The transmission lines, powered by the Marx modules, consist of cable headers, load protection switches and tri-plates interfacing to the center transition section through detachable current joints. A conical power-flow-channel attaches to the transition section providing an elevated interface to attach the experimental loads for diagnostic access. Fabrication and assembly of all components for the Atlas machine was completed in August 2000. The machine has also progressed through a test phase where the Marx module/transmission line units were fired, individually, into a test load. Progression continued with eight and sixteen lines being fired. Subsequently, an overall machine test was conducted where all 24 transmission lines were fired simultaneously, delivering 28.6 MA into the test load. The machine assembly went smoothly with very few problem areas developing during all phases of installation of the structure, oil tanks, transmission lines and center transition section. The target chamber and vacuum system have also been installed. All components are performing as designed

at the voltage and current levels expected at this point in the diagnostic testing. The machine was designed, fabricated, assembled and tested within the original budget and on schedule and is meeting the specified performance goals.
NTIS
Fabrication; Electric Potential; Vacuum Systems; Loads (Forces); Conical Flow

20020030077 Los Alamos National Lab., NM USA
Spectral output of z-machine implosions
Idzorek, G. C.; Chrien, R. E.; Jun. 01, 2001; 5p; In English
Report No.(s): DE2001-783298; LA-UR-01-3135; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Sandia National Laboratories Z-machine has developed into a reproducible, high power (>200 TW), high temperature (>200 eV) driver for radiation source with a bolometric temperature of about 200 eV. by surrounding the z-pinch implosion with a vacuum hohlraum a nearly Planckian source of about 140 eV temperature is created with peak radiation power of about 200 terawatts and integrated energy of 2 megajoules or more. In this energy rich environment we can field a dozen experiments all being driven by an identical source. In addition to 'standard' vacuum hohlraums we also use dynamic hohlraums consisting with two nested wire arrays converging onto an axially centered foam cylinder. Radiation flowing from the ends on the cylinder indicates a Planckian source temperature well over 200 eV. Only two experiments can be fielded on a dynamic hohlraum (one on each end) but the higher source temperature justifies the added complexity of the set-up. We routinely use arrays of filtered silicon photodiodes (SiD) and filtered photocathode x-ray diodes (XRD) to determine the temperature of the source. Three different techniques for unfolding spectra from the XRD and SiD detector data being used. They are: (1) Treat each detector independently and find the Planckian temperature for a given source size and solid angle that would give the measured detector signal, (2) Use all detector signals and detector spectral responses simultaneously and find a spectrum that best fits the observed data, (3) Use all detector signals and averaged detector spectral responses and find a histogram spectrum that best fits the observed data. When used as complementary set of analysis tools these techniques generate remarkably consistent results showing nearly Planckian behavior on our vacuum hohlraum experiments.
NTIS
Implosions; Radiation Sources; Photocathodes; Hohlraums

20020030078 Los Alamos National Lab., NM USA
Atlas: a new pulsed power tool at los alamos national laboratory
Scudder, D. W.; Archuleta, S. A.; Jun. 01, 2001; 5p; In English
Report No.(s): DE2001-783299; LA-UR-01-3136; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Atlas pulsed power driver has recently been commissioned at Las Alamos National Laboratory. This paper provides an overview of the Atlas facility, its initial experimental program and plans for the future. The reader desiring more detailed information is referred to papers in this conference by Keinigs et al on materials studies, Cochrane et al on machine performance and Ballard et al on fabrication and assembly. Atlas is a high current generator capable of driving 30 megamps through a low-inductance load. It has been designed to require minimal maintenance, provide excellent diagnostic access, and rapid turnaround. Its capacitor bank stores 23.5 megajoules in a four-stage Marx configuration which erects to 240 kV at maximum charge. It has a quarter-cycle time of 4.5 microseconds. It will typically drive cylindrical aluminum liners in a z-pinch configuration to velocities up to 10 mm/usec while maintaining the inner surface in the solid state. Diagnostic access include 360deg of radial view as well as axial views from above and below. The photograph shows the circle of tanks containing capacitor banks, the diagnostic platform and load area. Atlas construction began in 1996 and high-current acceptance tests were completed in December of 2000. Initial shots include liner characterization shots using a target design similar to NTLX experiments (see several pages by Turchi et al., this meeting). These will be followed by experiments studying hydro features, useful for validating hydrodynamics algorithms used in weapons computer codes. DOE plans to relocate the Atlas generator to the Nevada Test Site as early as 2002, where it will continue its experimental program supporting the Stockpile Stewardship program and other users.
NTIS
Zeta Pinch; Hydrodynamics; High Current; Cylindrical Bodies; Aluminum

20020030246 Brookhaven National Lab., Upton, NY USA
Rhic and the pursuit of the quark-gluon plasma
Mitchell,; Jul. 25, 2001; 14p; In English
Report No.(s): DE2001-789787; BNL-68850; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
There is a fugitive on the loose. Its name is Quark-Glluon Plasma, alias the QGP. The QGP is a known informant with knowledge about the fundamental building blocks of nature that we wish to extract. This briefing will outline the status of the

pursuit of the elusive QGP. We will cover what makes the QGP tick, its modus operandi, details on how we plan to hunt the fugitive down, and our level of success thus far.
NTIS
Plasmas (Physics); Extraction

20020031240 Ohio Aerospace Inst., Brook Park, OH USA
Floating Potential Probe Langmuir Probe Data Reduction Results
Morton, Thomas L., Ohio Aerospace Inst., USA; Minow, Joseph I., Sverdrup Technology, Inc., USA; [2002]; 11p; In English; 40th AIAA Aerospace Sciences Meeting and Exhibit, 14-17 Jan. 2002, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Contract(s)/Grant(s): NCC3-801; NAS8-00187
Report No.(s): AIAA Paper 2002-0936; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche
During its first five months of operations, the Langmuir Probe on the Floating Potential Probe (FPP) obtained data on ionospheric electron densities and temperatures in the ISS orbit. In this paper, the algorithms for data reduction are presented, and comparisons are made of FPP data with ground-based ionosonde and Incoherent Scattering Radar (ISR) results. Implications for ISS operations are detailed, and the need for a permanent FPP on ISS is examined.
Author
Electrostatic Probes; Ionospheric Temperature; Electron Density Profiles; Algorithms; Data Reduction; International Space Station

20020031250 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA
Polar Plasma Wave Observations in the Auroral Region and Polar Cap
Menietti, J. D., Iowa Univ., USA; Averkamp, T. F., Iowa Univ., USA; Kirchner, D. L., Iowa Univ., USA; Pickett, J. S., Iowa Univ., USA; Persoon, A. M., Iowa Univ., USA; Gurnett, D. A., Iowa Univ., USA; Physics of Space Plasma; 1998, No. 15; 6p; In English
Contract(s)/Grant(s): NAS5-30371; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Auroral kilometric radiation (AKR), sometimes associated with auroral myriametric radiation (AMR), has been observed by the plasma wave instrument on board Polar on almost every northern hemisphere pass. High spectral resolution plots of the AKR obtained by the wide-band receiver of the plasma wave instrument on board the spacecraft often show discrete, negative-slope striations each extending over a period of several seconds. A preliminary survey of over 4000 spectrograms (each for 48 seconds of data) indicates that the striations are seen in the northern hemisphere near apogee about 5% of the time. The frequency range is 40 kHz less than f less than 100 kHz, but a few observations of signatures have been made at higher frequency (f less than 225 khz. The frequency drift rates R, are similar ranging from -9.0 kHz/sec less than R less than -1.0 kHz/sec. No data is currently available for perigee (southern hemisphere) passes. The paucity of positive-slope features may be due to the location of the satellite at altitudes well above the AKR source region. Past studies have suggested these features are due to AKR wave growth stimulated by the propagation of electromagnetic ion cyclotron waves travelling up (-R) or down (+R) the field line, through the source region. High-resolution waveform data from both Polar and FAST show the presence of solitary waves in the auroral region which may also be a source of these striations. AMR is seen as diffuse emission associated with, but at lower frequency than the lower AKR. Direction finding of these emissions is not conclusive, but for one case, they have a source region distinct from the magnetic field line containing the AKR source, but possibly associated with the auroral cavity density gradient.
Author
Plasma Waves; Polar Regions; Polar Caps; Auroral Zones; Electromagnetic Radiation

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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.

20020027247 Vermont Univ., Burlington, VT USA
The Role of Codopants in Er Doped Si Material and Devices ***Final Report, 1 May 1998-30 Apr. 2001***
Varhue, Walter; Apr. 2001; 11p; In English
Contract(s)/Grant(s): DAAG55-98-1-0291
Report No.(s): AD-A398333; ARO-37851.4-EL-DPS; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this investigation was to determine the role of co-dopants in the effort to obtain useful EL from Er doped Si devices. One unforeseen difficulty was the essential role that co-dopants played in the simple epitaxial growth of Er doped Si material. Without co-dopants, the Er introduced during growth, segregates to the growth surface and prevents single crystal formation. It was decided to produce films with varying 0 and/or 0/C co-doping concentrations. This material was found to produce a strong PL response as hoped. The next step was to produce a device that incorporated this material into the vicinity of the metallurgical junction that defined the PN junction. First it was necessary to prove that our overall process could be used to fabricate working PN junctions with large reverse bias voltages. This was not automatic, and it was necessary to develop a process that would reproducibly give diodes with high reverse bias voltages. This work was more involved than originally anticipated and actually resulted in a patent application of the process. Several Er doped Si diodes were fabricated from material that produced strong PL signals, however no EL was observed. It was concluded that due to device geometry, the EL signal was too low for our low efficiency detector to see.
DTIC
Doped Crystals; P-N Junctions; Light Emitting Diodes

20020027256 National Inst. of Materials Physics, Bucharest, Romania
International Workshop on Amorphous and Nanostructured Chalcogenides. Fundamentals and Applications, Part 1
Popescu, Mihai A.; Jun. 2001; 435p; In English; 1st; International Workshop on Amorphous and Nanostructured Chalcogenides. Fundamentals and Applications, 25-28 Jun. 2001, Bucharest, Romania; For individual articles, see AD-P011 500 thru AD-P011 563
Report No.(s): AD-A398590; ISSN 1454-4164; No Copyright; Avail: CASI; A04, Microfiche; A19, Hardcopy
Includes papers presented at the First International Workshop on Amorphous and Nanostructured Chalcogenides Fundamentals and Applications held in Bucharest, Romania June 25-28, 2001.
DTIC
Optical Properties; Glass; Semiconductors (Materials); Chalcogenides; Amorphous Materials

20020027273 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Topology and Low Lying Fermion Modes
Edwards, R. G.; Aug. 01, 2001; 9p; In English
Report No.(s): DE2001-789468; JLAB-THY-01-33; DOE/ER/40150-1963; No Copyright; Avail: Department of Energy Information Bridge
Recent results concerning the relation of topology and low-lying fermion modes are summarized.
NTIS
Fermions; Topology

20020027281 Brookhaven National Lab., Upton, NY USA
Common coil magnet for testing high field superconductors
Ghosh,; Cozzolino,; Harrison,; Sampson,; Wanderer,; Mar. 29, 1999; 3p; In English
Report No.(s): DE2001-789360; BNL-68717; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A one-meter long magnet has been fabricated to provide background field for testing racetrack shaped coils made from high field materials such as Nb3Sn, Nb3Al and the new high temperature superconductors, BSCCO and YBCO. The magnet is of the double aperture common coil type and uses high current Nb-Ti main coils to produce an applied field of approximately 7T on inner coils fabricated from pre-reacted tape conductors. The performance of the magnet is summarized along with test results from insert coils wound from Nb3Sn ribbon conductor.
NTIS
Fabrication; High Temperature Superconductors; Magnet Coils; BSCCO Superconductors; YBCO Superconductors

20020027283 Brookhaven National Lab., Upton, NY USA
Experimental study of ion injection into an extended trap of the bnl ebis
Pikin,; Alessi,; Beebe,; Kponou,; Prelec,; Sep. 02, 2001; 7p; In English
Report No.(s): DE2001-789377; BNL-68729; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Experiments on the BNL EBIS Test Stand (EBTS) with the ion trap extending beyond the edges of the superconducting solenoid had the main goal to study ion trap operation with a trap length exceeding that of the normal EBTS trap. Preliminary results indicate that the ion trap with length 107 cm is stable and controllable in the same fashion as our normal 70 cm trap with a multiampere electron beam. EBTS operation with ion trap 145 cm long and with electron current up to 3 A in earlier experiments

also was stable and yielded more ions than from the basic ”short” trap. These results increased our confidence in operation of the proposed RHIC in a stable mode and in the correctness of linear scaling of ion intensity with the length of the ion trap.
NTIS
Electron Beams; Ion Sources; Ion Injection

20020027480 Fermi National Accelerator Lab., Batavia, IL USA
Recent results from CDF and status of CDF-II
Pagliarone, C.; Dec. 07, 2001; 17p; In English
Report No.(s): DE2001-789371; FERMILAB-CONF-01/363-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The CDF detector collected during 1992-95 (Run I) a data sample of 110 pb(sup -1) p(bar p) collisions at a center of mass energy (radical)s = 1.8 TeV. A large variety of physical studies and measurements has been performed using these data. The current paper wants to review results obtained using this data sample as well as discuss the CDF-II upgrades and physical potential of the upgraded CDF Detector (CDF-II) in the Run II.
NTIS
Particle Accelerators; Particle Collisions

20020027481 Fermi National Accelerator Lab., Batavia, IL USA
Underlying event in jet and minimum bias events at the Tevatron
Tano, V.; Dec. 07, 2001; 4p; In English
Report No.(s): DE2001-789370; FERMILAB-CONF-01/362-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We describe a study of the underlying event in jet and minimum bias events using data from the CDF detector. The underlying event contribution to the jet energy has been calculated in jet events and compared to the results of two Monte Carlo programs: Herwig and Pythia. The analysis has been carried out at two different center of mass energies: (radical)s = 1800 and 630 GeV. For most observables, good agreement is obtained with at least one of the Monte Carlo programs. Neither program describes all features of the data.
NTIS
Particle Accelerators; Particle Collisions

20020027482 Fermi National Accelerator Lab., Batavia, IL USA
CDF-II silicon tracking system
Nelson, T. K.; Dec. 07, 2001; 8p; In English
Report No.(s): DE2001-789368; FERMILAB-CONF-01/358-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The CDF silicon tracking system for Run II of the Fermilab Tevatron consists of eight layers arranged in cylinders spanning radii from 1.35cm to 28cm, and lengths from 90cm to nearly two meters for a total of six square meters of silicon and 722,000 readout channels. With an innermost layer (Layer 00) utilizing radiation tolerant p(sup +)-in-n silicon and low-mass readout cables between the sensors and readout electronics, double-sided vertexing layers (SVXII) designed for use with a dead timeless secondary-vertex trigger, and outermost layers (ISL) utilizing mass-producible modules attached to a carbon fiber spaceframe, this system is a starting point for the next generation of silicon trackers for the LHC and Tevatron.
NTIS
Particle Accelerators; Particle Collisions

20020027483 Fermi National Accelerator Lab., Batavia, IL USA
CDF layer 00 detector
Nelson, T. K.; Dec. 07, 2001; 3p; In English
Report No.(s): DE2001-789367; FERMILAB-CONF-357-E; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The CDF Layer 00 detector consists of single-sided silicon sensors assembled on the beampipe, forming the innermost of eight silicon layers in the CDF detector for Run II of the Fermilab Tevatron. Radiation tolerant p-in-n silicon with 25(50) (micro)m implant(readout) pitch are mounted on a lightweight, cooled support structure and connect to electronics outside the tracking

volume via long, fine-pitch cables. Layer 00 will significantly improve the impact parameter resolution and enhance the longevity of the silicon system, benefiting a large portion of the physics program for Run II.
NTIS
Particle Accelerators; Particle Collisions

20020027540 NASA Glenn Research Center, Cleveland, OH USA
Crystallographic Texture and Orientation Variants in Al2O3-Y3Al5O12 Directionally Solidified Eutectic Crystals
Frazer, Colleen S., Kentucky Univ., USA; Dickey, Elizabeth C., Kentucky Univ., USA; Sayir, Ali, NASA Glenn Research Center, USA; [2001]; 20p; In English
Contract(s)/Grant(s): NCC3-850; DE-FG02-98ER-45710; DE-AC05-00OR-22752; F49620-99-1-0266; RTOP 708-31-13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Eutectic rods of Al2O3 and Y3Al5O12 were grown by a laser-heated float zone method, and their microstructure and crystallographic texture were studied by scanning electron microscopy, electron backscattered diffraction and x-ray diffraction. The composites were found to be highly textured with two twin-related crystallographic orientation relationships between the phases. Electron backscattered diffraction was employed to determine the spatial distribution of the orientational variants within the samples and to define the crystallographic orientation of various microstructural features.
Author
Aluminum Oxides; Crystallography; Eutectics; Directional Solidification (Crystals); Microstructure; Yttrium-Aluminum Garnet; Textures

20020027679 National Renewable Energy Lab., Golden, CO USA
Next Generation Thin Films for Photovoltaics: InGaAsN; Preprint
Jones, E. D.; Allerman, A. A.; Klem, J. F.; Kurtz, S. R.; Modine, N. R.; Apr. 01, 1999; 18p; In English
Report No.(s): DE2001-789287; NREL/CP-520-29589; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A new semiconductor alloy system, InGaAsN, has been identified as a candidate material for multi-junction solar cells having efficiencies greater than 40%. The introduction of small amounts of nitrogen ((approx)2%) into the InGaAs alloy system greatly reduces the band gap energy, with reductions approaching 0.4 eV for 2% nitrogen content. With the appropriate ratio of indium to nitrogen concentrations, InGaAsN can be lattice matched to GaAs.
NTIS
Indium Gallium Arsenides; Semiconductors (Materials); Thin Films; Nitrogen; Photovoltaic Cells

20020028007 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Improved heteroepitaxial MBE GaN growth with a Ga metal buffer layer
Kim, Y.; Subramanya, S. G.; Krueger, J.; Siegle, H.; Shapiro, N.; May 15, 2000; 6p; In English
Report No.(s): DE2001-789120; LBNL-45958; No Copyright; Avail: Department of Energy Information Bridge

We demonstrate that the use of pure gallium (Ga) as a buffer layer results in improved crystal quality of GaN epilayers grown by plasma-assisted molecular beam epitaxy (MBE) on c-plane sapphire. The resulting epilayers show electron Hall mobilities as high as 400 cm 2 /Vs at a background carrier concentration of 4 x 10 (exp 17) cm (exp -3), an outstanding value for an MBE-grown GaN layer on sapphire. Structural properties are also improved; the asymmetric (101) X-ray rocking curve width is drastically reduced with respect to that of the reference GaN epilayer grown on a low-temperature GaN buffer layer. Nitrided Ga metal layers were investigated for different Ga deposition time. These layers can be regarded as templates for the subsequent Ga main layer growth. It was found that there is an optimum Ga metal layer deposition time for improving the electron mobility in the epilayer. Heating of the Ga metal layer to the epilayer growth temperature under nitrogen plasma is found to be sufficient to produce highly oriented GaN crystals. However, nonuniform surface morphology and incomplete surface coverage were observed after nitridation of comparatively thick Ga metal layers. This is shown to be the reason for the decreasing electron mobility of the epilayers as the Ga metal layer thickness exceeds the optimum value.
NTIS
Buffers (Chemistry); Electron Mobility; Gallium; Molecular Beam Epitaxy; Gallium Nitrides

20020028158 Stanford Univ., Stanford, CA USA

Patterned Self-Assembly in Non-Stoichiometric Semiconductors ***Final Report, 1 Jun. 1997-31 May 2001***

Harris, J. S., Jr.; Kiehl, R. A.; Nov. 30, 2001; 5p; In English

Contract(s)/Grant(s): F49620-97-1-0444

Report No.(s): AD-A398657; AFRL-SR-BL-TR-02-0007; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This Final Report covers the research on two projects: self-assembly by controlled precipitation and thin lateral oxide barrier fabrication. We obtained several important experimental findings that demonstrate the practicality of these techniques for high-throughput nanostructure fabrication. Three of our findings demonstrated experimentally the capabilities of the controlled precipitation process and the fourth increased understanding of the mechanism. We also characterized and compared oxides produced by two thin lateral oxide barrier fabrication processes.

DTIC

Nanofabrication; Nanostructures (Devices); Oxides; Self Assembly; Semiconductors (Materials)

20020028811 Web-Feet Research, Inc., Monterey, CA USA

Drivers, Accelerators, and Inhibitors for Solid State Drive Markets

Andrei, Radu, Web-Feet Research, Inc., USA; Non-Volatile Memory Technology Symposium 2001: Proceedings; November 2001, pp. 124-146; In English; Also announced as 20020028797; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This viewgraph presentation gives an overview of drivers, accelerators, and inhibitors for solid state drive markets. Details are given on a forecast of storage needs, direct (memory cards) storage, and indirect (HDD market structure) storage. HDD is compared to solid state drive's (SSD's) density, media and interface transfer rate, product positioning, performance premium, density premium, and cost. Data warehousing/mining, streaming A/V, and RAID configurations are outlined.

CASI

Market Research; Memory (Computers); Solid State

20020029293 Sandia National Labs., Albuquerque, NM USA

Investigation of Nanoscience Technologies ***Final Report***

Burns, A. R.; Michalske, T. A.; Nov. 01, 2001; 8p; In English

Report No.(s): DE2001-789580; SAND2001-3398; No Copyright; Avail: Department of Energy Information Bridge

The intention of this project was to collaborate with Harvard University in the general area of nanoscale structures, biomolecular materials and their application in support of Sandia's MEMS technology. The expertise at Harvard was crucial in fostering these fundamentally interdisciplinary developments. Areas that were of interest included: (1) nanofabrication that exploits traditional methods (from Si technology) and developing new methods; (2) self-assembly of organic and inorganic systems; (3) assembly and dynamics of membranes and microfluidics; (4) study of the hierarchy of scales in assembly; (5) innovative imaging methods; and (6) hard (engineering)/soft (biological) interfaces. Specifically, we decided to work with Harvard to design and construct an experimental test station to measure molecular transports through single nanopores. The pore may be of natural origin, such as a self-assembled bacterial protein in a lipid bilayer, or an artificial structure in silicon or silicon nitride.

NTIS

Microelectronics; Nanotechnology; Nanofabrication; Imaging Techniques; Microelectromechanical Systems; Lipids

20020029622 Los Alamos National Lab., NM USA

In situ biaxial texture analysis of mgo films during growth on amorphous substrates by ion beam-assisted deposition

Brewer, R. T.; Arendt, P. N.; May 01, 2001; 7p; In English

Report No.(s): DE2001-781254; LA-UR-01-2759; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We used a previously reported kinematical electron scattering model 1 to develop a RHEED based method for performing quantitative analysis of mosaic polycrystalline thin film in-plane and out-of-plain grain orientation distributions. RHEED based biaxial texture measurements are compared to X-Ray and transmission electron microscopy measurements to establish the validity of the RHEED analysis method. In situ RHEED analysis reveals that the out of plane orientation distribution starts out very broad, and then decreases during IBAD MgO growth. Other results included evidence that the in-plane orientation distribution narrows, the grain size increases, and the film roughens as film thickness increases during IBAD MgO growth. Homoepitaxy of MgO improves the biaxial texture of the IBAD layer, making X-ray measurements of IBAD films with an additional homoepitaxial layer not quantitatively representative of the IBAD layer. Systematic offsets between RHEED analysis

and X-ray measurements of biaxial texture, coupled with evidence that biaxial texture improves with increasing film thickness, indicate that RHEED is a superior technique for probing surface biaxial texture.
NTIS
Substrates; Deposition; Amorphous Materials; Quantitative Analysis; Polycrystals; Design Analysis

20020029713 Rutherford Appleton Lab., ISIS Facility, Chilton, UK
Interpretation of Two X-ray studies of Vanadium Sesquioxide (V2O3)
Lovesey, S. W.; Sivia, D. S.; Knight, K. S.; Oct. 12, 2001; 22p; In English
Report No.(s): PB2002-102714; RAL-TR-2001-040; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Recent studies of V2O3 include experiments performed with x-rays, and exploit atomic resonances of V ions. In one case the K-edge resonance has been used to enhance Bragg intensities, and in a second experiment the absorption signal has been monitored at L2 and L3 edges. Data collected on magnetically order V2O3 is successfully interpreted on the basis of an atomic model, and the established chemical and magnetic structures. The extensive diffraction data gathered in azimuthal-angle scans at charge-forbidden reflections is found to infer the V ion wavefunction, which in turn permits estimate to be made of atomic quantities not measured by diffraction, and including the absorption signal.
NTIS
X Rays; Magnetic Field Configurations; Meson Resonance; Wave Functions; Bragg Angle; Diffraction; Metal Oxides

20020029841 Los Alamos National Lab., NM USA
Effect of la doping on magnetic structure in heavy fermion cerhin5
Bao, W.; Christianson, A. D.; Jun. 01, 2001; 6p; In English
Report No.(s): DE2001-782766; LA-UR-01-3711; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The magnetic structure of Ce0.9La0.1RhIn5 is measured using neutron diffraction. It is identical to the incommensurate transverse spiral for CeRhIn5, with a magnetic wave vector qM=(1/2, 1/2, 0.297), a staggered moment of 0.38(2) uB at 1.4K and a reduced Neel temperature of 2.7 K.
NTIS
Neutron Diffraction; Magnetic Field Configurations; Fermions

20020029845 Los Alamos National Lab., NM USA
Pairing in inhomogeneous superconductors
Eroles, J.; Ortiz, G.; Nov. 01, 1999; 5p; In English
Report No.(s): DE2001-787246; LA-UR-99-6045; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Starting from a t-J model, we introduce inhomogeneous terms to mimic stripes. We find that if the inhomogeneous terms break the SU(2) spin symmetry the binding between holes is tremendously enhanced in the thermodynamic limit. In any other model (including homogeneous models) the binding in the thermodynamic limit is small or negligible. by including these inhomogeneous terms we can reproduce experimental neutron scattering data. We also discuss the connection of the resulting inhomogeneity-induced superconductivity to recent experimental evidence for a linear relation between magnetic incommensurability and the superconducting transition temperature, as a function of doping.
NTIS
Inhomogeneity; Neutron Scattering; Superconductors (Materials); Superconductivity

20020029851 Los Alamos National Lab., NM USA
Dissimilar welds for the APT superconducting cavity's cryogenic plumbing system
Cola, M. J.; Teter, D. F.; Nov. 01, 1999; 5p; In English
Report No.(s): DE2001-787310; LA-UR-99-5856; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In the present study, welding parameters were developed and this paper highlights the salient microstructural features associated with the interface regions between the base metals and the interlayer metal, and reports on the mechanical properties of various joint combinations. to accomplish this, specimens were metallurgically prepared from as-welded and tested joints, and analyzed using light, scanning electron and transmission electron microscopy.
NTIS
Superconductivity; Welded Joints; Welding; Light Transmission; Microstructure

20020029919 Los Alamos National Lab., NM USA

Nanocrystal quantum dots: building blocks for tunable optical amplifiers and lasers

Hollingsworth, J.; Mikhailovsky, A.; May 01, 2001; 7p; In English

Report No.(s): DE2001-780885; LA-UR-01-2673; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We study optical processes relevant to optical amplification and lasing in CdSe nanocrystal quantum dots (NQD). NQDs are freestanding nanoparticles prepared using solution-based organometallic reactions originally developed for the Cd chalcogenides, CdS, CdSe and CdTe(J. Am. Chem. Soc. 115,8706 (1993)). We investigate NQDs with diameters ranging from 2 to 8nm. Due to strong quantum confinement, they exhibit size-dependent spectral tunability over an energy range as wide as several hundred meV. We observe a strong effect of the matrix/solvent on optical gain properties of CdSe NQDs. In most of the commonly used solvents (such as hexane and toluene), gain is suppressed due to strong photoinduced absorption associated with carriers trapped at solvent-related interface states. In contrast, matrix-free close packed NQD films (NQD solids) exhibit large optical gain with a magnitude that is sufficiently high for the optical gain to successfully compete with multiparticle Auger recombination (Science 287,10117(2000)). These films exhibit narrowband stimulated emission at both cryogenic and room temperature, and the emission color is tunable with dot size (Science 290,314(2000)). Moreover, the NQD films can be incorporated into microcavities of different geometries (micro-spheres, wires, tubes) that produce lasing in whispering gallery modes. The facile preparation, chemical flexibility and wide-range spectral tunability due to strong quantum confinement are the key advantages that should motivate research into NQD applications in optical amplifiers and lasers.

NTIS

Nanocrystals; Lasers; Cadmium Selenides; Organometallic Compounds; Light Amplifiers; Chalcogenides

20020030026 Cape Simulations, Inc., Newton, MA USA

Computational Simulation of Containment Influence on Defect Generation During Growth of GeSi ***Final Report***

Motakef, Shariar, Cape Simulations, Inc., USA; Yesilyurt, S., Cape Simulations, Inc., USA; Vujisic, L., Cape Simulations, Inc., USA; Dec. 24, 2001; 35p; In English

Contract(s)/Grant(s): NAS8-98252; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report contains results of theoretical work in conjunction with the NASA RDGS program. It is specifically focused on factors controlling the stability of detachment and the sensitivity of the detachment process to the processing and geometric parameters of the crystal growth process.

Author

Containment; Crystal Growth; Detachment; Computerized Simulation; Stability

20020030237 Argonne National Lab., IL USA

Phenomenology of high-temperature superconductive materials

Gray, K. E.; Nov. 01, 2001; 9p; In English

Report No.(s): DE2001-789728; ANL/MSD/CP-106154; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

High-temperature superconductors offer considerable promise for high current applications. Some of the relevant issues, such as materials, grain boundaries and dissipation, will be introduced and both the fundamental and practical aspects will be addressed. For example, the first generation powder-in-tube wires based on the bismuth cuprate have restricted high field performance at liquid nitrogen temperature due to the weak inter-bilayer coupling of magnetic vortices. The second generation coated conductor uses Yba2Cu3O7 to overcome this, but it requires a high degree of biaxial texturing in order to provide notable performance in high fields in liquid nitrogen.

NTIS

High Temperature Superconductors; Grain Boundaries; Copper Oxides; YBCO Superconductors

20020030239 Argonne National Lab., IL USA

Novel features of Josephson flux-fow in Bi-2212: contribution of in-plane dissipation, coherent response to mm-wave radiation, size effect

Latyshev, Y. I.; Koshelev, A. E.; Pavlenko, V. N.; Gaifullin, M.; Yamashita, T.; Dec. 19, 2001; 20p; In English

Report No.(s): DE2001-789742; ANL/MSD/CP-106468; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We studied Josephson flux-flux (JFF) in Bi-2212 stacks fabricated from single crystal whiskers by focused ion beam technique. For long junctions with the in-plane sizes 30 x 2 un2, we found considerable contribution of the in-plane dissipation to the JFF resistivity, p-jff, at low temperatures. According to recent theory (A. Koshelev, Phys. Rev. B62, R3616 (2000)) that

results in quadratic type of dependence of p-jff(B) with the following saturation. The I-V characteristics in JFF regime also can be described consistently by that theory. In JFF regime we found Shapiro-step response to the external mm-wave radiation. The step position is proportional to the frequency of applied microwaves and corresponds to the Josephson emission from all the 60 intrinsic junctions of the stack being synchronized. That implies the coherence of the JFF over the whole thickness of the stack and demonstrates possibility of synchronization of intrinsic junctions by magnetic field. We also found a threshold character of an appearance of the JFF branch on the I-V characteristic with the increase of magnetic field, the threshold field Bt being scaled with the junction size perpendicular to the field L (L=30-1.4um), as Bt=0/Ls, where 0 is flux quantum s is the interlayer spacing. On the I-V characteristics of small stacks in the JFF regime we found Fiske-step features associated with resonance of Josephson radiation with the main resonance cavity mode in transmission line formed by stack.
NTIS
Josephson Effect; Millimeter Waves; Coherent Radiation; Resonance Fluorescence; Electrical Resistivity; Magnetic Fields; Radiation Effects

20020032228 Houston Univ., TX USA
The U/N Method: Record Critical Currents Achieved by Tailored Pinning Centers ***Final Report, 15 Apr. 1998-14 Apr 2002***
Weinstein, Roy; Nov. 2001; 8p; In English
Contract(s)/Grant(s): DAAG55-98-1-0250
Report No.(s): AD-A398865; ARO-38299.21-MS; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
The aim of this project was to develop significantly improved high temperature superconductor (HTS) via improved pinning. In particular the work focused on the ”U/n process” in which U is added to HTS, and then irradiated with thermal neutrons to fission some of the U-235. This process raised J(sub c) in YBa2Cu3O7 (Y123) to world record levels. The U/n process was studied in Bi1SR2Ca2Cu3O10 (BSCCO 2223). Again, world record J(sub c) was achieved plus record H(sub irr) and isotropy. J(sub c) and isotropy were increased by factors of up to 100, and H(sub irr) was more than doubled. U/n processing was also developed for Nd123. This is not yet optimized, but to date J(sub c) greater than 150,000 A/sq cm in Nd123, a world record. The increases in J(sub c) achieved are sizable, not marginal (e.g., a factor of 40 in Y123 at T = 77K, B = 0.25T). It was proven, first theoretically and then experimentally, that in the specific HTS Sm123 and Gd123 the U/n process cannot be used for large objects. The success of U/n pinning has been studied and is found to be attributable to multiple in-line defects - a domain of high-energy ion damage only sparsely studied for HTS characterizations.
DTIC
High Temperature Superconductors; Pinning

20020032239 Air Force Research Lab., Sensors Directorate, Wright-Patterson AFB, OH USA
Deposition and Characterization of Barrier Metals ***Final Report, 9 Mar. 1995-30 Apr. 2001***
Leedy, Kevin D.; Sep. 2001; 34p; In English; Original contains color images
Contract(s)/Grant(s): Proj-2300
Report No.(s): AD-A399034; AFRL-SN-WP-TR-2001-1107; No Copyright; Avail: Defense Technical Information Center (DTIC)
Increasing complexity and shrinking sizes of integrated circuits necessitate the development of new materials and processes to meet current system requirements of high performance and reliability in smaller electronic assemblies. In order to achieve the system performance, materials with incompatible physical and electrical properties are often placed into direct contact with one another. Applications such as area array interconnection of Si devices using lead/tin solders, vias in Si integrated circuits and gold contacts to GaAs circuits require the use of barrier metals to physically and chemically separate materials that would otherwise react and form undesirable by-products or significantly decrease the reliability of the electronic system. This effort was initiated in order to advance the understanding of basic mechanisms and influences of processing on the performance of barrier metals. Deposition of the barrier metals was conducted using physical vapor deposition, unique barrier metal alloys that could not be fabricated by thermodynamic equilibrium methods were developed. Characterization of the processing and materials was performed to better understand the essential mechanisms required for high quality barrier metals.
DTIC
Thin Films; Vapor Deposition; Integrated Circuits; Barrier Layers

20020032305 Thermoscience Inst., Moffett Field, CA USA
Multilayer Relaxation Features on (100) and (111) Surfaces of Beta-SiC
Halicioglu, Timur, Thermoscience Inst., USA; [1995]; 1p; In English
Contract(s)/Grant(s): NAS2-14031; No Copyright; Avail: Issuing Activity; Abstract Only

Multilayer relaxation features were investigated for beta-SiC surfaces. Calculations include (1 x 1), (2 x 1) and c(2 x 2) phases of the (100) surface, and the (1 x 1) structure of the (111) surface. For both C- and Si-terminated surfaces, variations in the top three interlayer spacings were calculated. The largest vertical displacement was calculated for the top interlayer spacing of the (111) surface. In general, it was found that top interlayer spacings contract, while the second interlayer spacings expand moderately. The third interlayer spacings, on the other hand, were found to exhibit very small amounts of contractions. Dimerization energies and bond distances were also calculated for reconstructed phases of the (100) surface. Calculated results were compared with data from the literature.
Author
Silicon Carbides; Interlayers

20020032611 Thermoscience Inst., Moffett Field, CA USA
Properties of Diamond and Diamond-Like Clusters in Nanometric Dimensions
Halicioglu, Timur, Thermoscience Inst., USA; [1996]; 1p; In English
Contract(s)/Grant(s): NAS2-14031; No Copyright; Avail: Issuing Activity; Abstract Only
Variations in materials properties of small clusters of nanometric dimensions were investigated. Investigations were carried out for diamond and diamond-like particles in spherical shapes. Calculations were performed for clusters containing over 1000 carbon atoms. Results indicate that as the cluster size diminishes, (i) the average cohesive energy becomes weaker, (ii) the excess surface energy increases, and (iii) the value for stiffness decreases.
Author
Diamonds; Nanotechnology; Mechanical Properties

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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.

20020027223 Johannes Kepler Univ., Linz Austria
Fifth International Conference on Intersubband Transitions in Quantum Wells, Volume 7
Helm, Manfred, Editor; Unterrainer, Karl, Editor; Apr. 2000; ISSN 1386-9477; 318p; In English, 7-11 Sep. 1999, Bad Ischl, Austria
Contract(s)/Grant(s): N00014-99-1-1049
Report No.(s): AD-A398500; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche
This volume contains papers presented at the 5th International Conference on Intersubband Transitions in Quantum Wells (ITQW'99) held 7-11 September in Bad Ischl, Austria. The field of intersubband transitions in quantum wells has experienced impressive growth in the early 90s and has now stabilized and matured. As a consequence, there are two directions in research: (1) application of intersubband transitions in 'real' devices, and (2) investigation of the basic intersubband physics. The list of topics presented includes: intersubband detectors and lasers, intersubband emission in the far-infrared or THz range, and intersubband transitions in quantum dots. Additional topics include infrared band-gap lasers and Bloch oscillation.
DTIC
Conferences; Quantum Wells; Nanotechnology; Electron Transitions

20020027357 Brookhaven National Lab., Upton, NY USA
Progress toward a muon ring cooler
Kirk,; Cline,; Fukui,; Garren,; Jul. 01, 2001; 7p; In English
Report No.(s): DE2001-789362; BNL-68735; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We describe progress toward the design and analysis of a storage ring for cooling a muon beam by the process of ionization cooling. Our primary strategy entails the design and optimization of the lattice using the code SYNCH, followed by the transfer of parameters to the code ICOOL which allows for the tracking of particles through rf cavities and absorbers of various dimensions. Our ultimate goal is to obtain longitudinal cooling and either transverse cooling or minimal transverse emittance heating.
NTIS
Muons; Storage Rings (Particle Accelerators); Design Analysis; Cooling; Ionization

20020029854 Los Alamos National Lab., NM USA

Quantum technology

Vieira, D. J.; Crane, S. G.; Nov. 01, 1999; 24p; In English

Report No.(s): DE2001-787249; LA-UR-99-2934; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This is the final report of a two-year, Laboratory-Directed Research and Development (LDRD) project at the Los Alamos National Laboratory (LANL). Recent developments in atomic and optical physics involving trapped ions and atoms have revolutionized our ability to control and manipulate quantum-mechanical systems. Using this new technology we have undertaken fundamental quantum mechanical experiments to study: quantum computation with laser-cooled calcium ions; all-optical quantum computation; 'interaction-free' measurements, parity violation in nuclear beta decay; and the ultrasensitive detection of selected species of environmental and nonproliferation interests.

NTIS

Quantum Mechanics; Trapped Particles; Atomic Physics; Beta Particles; Radioactive Decay

20020030241 Fermi National Accelerator Lab., Batavia, IL USA

Large Nc expansion in quantum chromodynamics

Bardeen, W. A.; Dec. 28, 2001; 6p; In English

Report No.(s): DE2001-789803; FERMILAB-CONF-01/387-T; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

I discuss methods based on the large Nc expansion to study nonperturbative aspects of quantum chromodynamics, the theory of the strong force. I apply these methods to the analysis of weak decay processes and the nonperturbative computation of the weak matrix elements needed for a complete evaluation of these decays in the Standard Model of elementary particle physics.

NTIS

Quantum Chromodynamics; Standard Model (Particle Physics)

20020031245 NASA Lewis Research Center, Cleveland, OH USA

High-Resolution Genuinely Multidimensional Solution of Conservation Laws by the Space-Time Conservation Element and Solution Element Method

Himansu, Ananda, Taitech, Inc., USA; Chang, Sin-Chung, NASA Lewis Research Center, USA; Yu, Sheng-Tao, Wayne State Univ., USA; Wang, Xiao-Yen, Taitech, Inc., USA; Loh, Ching-Yuen, Taitech, Inc., USA; Jorgenson, Philip C. E., NASA Lewis Research Center, USA; [1999]; 34p; In English; 37th AIAA Aerospace Sciences Meeting and Exhibit, 11-14 Jan. 1999, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 708-90-43

Report No.(s): AIAA Paper 99-1006; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this overview paper, we review the basic principles of the method of space-time conservation element and solution element for solving the conservation laws in one and two spatial dimensions. The present method is developed on the basis of local and global flux conservation in a space-time domain, in which space and time are treated in a unified manner. In contrast to the modern upwind schemes, the approach here does not use the Riemann solver and the reconstruction procedure as the building blocks. The drawbacks of the upwind approach, such as the difficulty of rationally extending the 1D scalar approach to systems of equations and particularly to multiple dimensions is here contrasted with the uniformity and ease of generalization of the Conservation Element and Solution Element (CE/SE) 1D scalar schemes to systems of equations and to multiple spatial dimensions. The assured compatibility with the simplest type of unstructured meshes, and the uniquely simple nonreflecting boundary conditions of the present method are also discussed. The present approach has yielded high-resolution shocks, rarefaction waves, acoustic waves, vortices, ZND detonation waves, and shock/acoustic waves/vortices interactions. Moreover, since no directional splitting is employed, numerical resolution of two-dimensional calculations is comparable to that of the one-dimensional calculations. Some sample applications displaying the strengths and broad applicability of the CE/SE method are reviewed.

Author

Conservation Laws; Unstructured Grids (Mathematics); Finite Volume Method; Numerical Analysis

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ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20020027456 General Accounting Office, Washington, DC USA
NASA. Status of Plans for Achieving Key Outcomes and Addressing Major Management Challenges
Nov. 2001; 42p; In English
Report No.(s): PB2002-102001; GAO-02-184; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We reviewed the National Aeronautics and Space Administration's (NASA) fiscal year 2002 performance plan required by the Government Performance and Results Act of 1993 (GPRA) to assess the agency's planned performance for the selected key outcomes that were identified as important mission areas for the agency. These are the same outcomes we addressed in our June 2000 review of NASA's fiscal year 1999 performance report and fiscal year 2001 performance plan to provide a baseline by which to measure the agency's performance from year to year. We also addressed these outcomes in our July 2001 review of NASA's fiscal year 2000 performance report. We are issuing this separate report on our assessment of the selected outcomes in NASA's fiscal year 2002 performance plan. The selected key outcomes are to expand scientific knowledge of the Earth system, expand the commercial development of space, and deploy and operate the International Space Station (ISS) safely and cost effectively.
NTIS
NASA Programs; Management Planning; Aeronautics

20020027999 General Accounting Office, Washington, DC USA
Regulatory Reform: Compliance Guide Requirement Has Had Little Effect on Agency Practices
Dec. 2001; 60p; In English
Report No.(s): PB2002-102588; GAO-02-172; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Small businesses comprise a significant portion of the USA' economy, accounting for 99 percent of all businesses, about 50 percent of the gross domestic product, and about 53 percent of the private industry's workforce. However, small businesses and other small entities (small governments and small nonprofit organizations) can be disproportionately affected by federal agencies' regulatory requirements, and agencies may inadequately consider the impact of those requirements on small entities when the requirements are implemented. In March 1996, Congress passed the Small Business Regulatory Enforcement Fairness Act (SBREFA) (5 U.S.C. 601 note), which was intended to, among other things, 'simplify the language of Federal regulations affecting small businesses' and 'develop more accessible sources of information on regulatory and reporting requirements for small businesses.' Section 212 of SBREFA requires agencies to publish one or more compliance guides for each rule or group of related rules for which the agency is required to prepare a final regulatory flexibility analysis (FRFA) under the Regulatory Flexibility Act (RFA). The relevant sections of the RFA (codified at 5 U.S.C. 604 and 605) generally require agencies to prepare a FRFA for every final rule for which a general notice of proposed rulemaking (NPRM) is required unless the head of the agency certifies that the rule will not have a 'significant economic impact on a substantial number of small entities.' You asked us to examine the implementation of section 212 of SBREFA in selected agencies. Specifically, you asked us to (1) determine whether the agencies have published small entity compliance guides for each covered rule published in selected years, and (2) describe how the agencies developed the guides and made them available to small entities affected affected by the rules. We focused our review on final rules published during calendar years 1999 and 2000 by six federal agencies: the Department of Commerce (DOC), the Centers for Medicare and Medicaid Services (CMS) and the Food and Drug Administration (FDA) within the Department of Health and Human Services (HHS), the Environmental Protection Agency (EPA), the Federal Communications Commission (FCC), and the Securities and Exchange Commission (SEC).
NTIS
Regulations; Economic Impact; Environment Protection; Information Systems; Commerce; Governments

20020028057 General Accounting Office, Washington, DC USA
Department of Energy: Fundamental Reassessment Needed to Address Major Mission, Structure, and Accountability Problems
Dec. 2001; 66p; In English
Report No.(s): PB2002-102644; GAO-02-51; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Created in 1977 from diverse agencies, DOE manages the nation's nuclear weapons production complex, cleans up the environmental legacy from the production of nuclear weapons, and conducts research and development on both energy and basic science. The relative emphasis given to these missions has changed over time. Early emphasis by the department on research and initiatives to cope with the global energy crisis quickly shifted to accelerated nuclear weapons production. However, by the late

1980s, DOE funding priorities again shifted to cleaning up the legacy of waste generated by the weapons complex, and this work remains DOE's largest budget category. Since then, DOE has placed increased emphasis on basic scientific research. DOE also has a role in helping to ensure the security of the nations energy infrastructure. The result is a department with complex and diverse missions. These diverse missions are largely implemented by contractors to carry out DOE's program and project activities at government-owned facilities and sites across the country. The department contracts out about 94 percent of its budget and has established an extensive network of field offices to directly oversee the work of these contractors and address other departmental responsibilities.
NTIS
Government Procurement; Nuclear Weapons; Security

20020029434 Societa Italiana Avionica S.p.A., Turin, Italy
Introduction: Technical Overview and State of the Art
Crovella, Luigi, Societa Italiana Avionica S.p.A., Italy; Tactical Decision Aids and Situational Awareness; January 2002, pp. 1-1 - 1-3; In English; Also announced as 20020029433; Copyright Waived; Avail: CASI; A01, Hardcopy

Today the use of Decision Aids Systems for Commander and Operators in the Battlefield area is playing an important role due to the new frequent situation of joint coalition and asymmetric warfare in which Defense Forces are involved. On these occasions, the capability of own Forces to follow the evolution of the Tactical Situation in real time is extremely important. Since Combat Survival and Mission Accomplishment depend upon Operators performance in the process of decision-making, and the Operators performance depends upon the degree of awareness, Situation Awareness can be seen as a result of a continuous assessment of situation parameters by the Operators. This Mission critical chain of sub-segment functions is greatly influenced by the nature of the technical systems the Operator is having to deal with. The purpose of the present Lecture Series is to provide to the audience: (1) Definition of the problem; (2) Overview of the state-of-the-art; (3) Description of some research and development programs; (4) Exposure to the end-users of the potential benefits of the decision aids employment; and (5) Future trends.
Author
Situational Awareness; Decision Support Systems; Decision Making

20020029436 Office of Naval Research, Arlington, VA USA
Tactical Decision Making: The Interaction of Human Perception and Judgment with Automated Information Processing and Presentation, 2, Decision Support
Marsh, Howard S., Office of Naval Research, USA; Quinn, Paul W., Office of Naval Research, USA; Toth, Gary J., Office of Naval Research, USA; Jakubek, David A., Office of Naval Research, USA; Tactical Decision Aids and Situational Awareness; January 2002, pp. 3-1 - 3-17; In English; Also announced as 20020029433; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy

Modern information technology can improve situational awareness and understanding far beyond the traditional "fog of war", but these improvements are useful only if the operators can apply that awareness and understanding to reach decisions better and faster than before. The goal is to achieve "decision superiority" not just information superiority. In the complex and fast-paced battlespace of the future, humans will rely more and more on information technology to deliver knowledge and to assist them in using that knowledge. As the range, speed, lethality, and cost of weapons increase, the human cognitive processes will have to be augmented by rapid, automated appraisal of the situation and the available courses of action. The decisions will have to be reached by a mix of human and machine reasoning, including a theater-wide perspective as well as a local perspective. This presents new challenges for the system developers and the operational concept developers, and those challenges are being addressed in a number of development and experimentation programs. This discussion extends the prior consideration of situational awareness and understanding to address the use of that awareness and understanding to determine the decision.
Author
Decision Making; Situational Awareness; Decision Support Systems

20020029437 Elektroniksystem- und Logistik G.m.b.H., Advanced Avionics Systems, Munich, Germany
Mission Management and Crew Assistance for Military Aircraft: Cognitive Concepts and Prototype Evaluation
Schulte, Axel, Elektroniksystem- und Logistik G.m.b.H., Germany; Tactical Decision Aids and Situational Awareness; January 2002, pp. 4-1 - 4-19; In English; Also announced as 20020029433; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy

This paper describes an approach to cognitive and co-operative operator assistance in the field of tactical flight mission management. A framework for a generic functional concept is derived from general considerations of human performance and

cognitive engineering. A system built according to these human-centered design principles will be able to keep up with the change of situation parameters, in order to provide situational adapted operator assistance. Such a Cognitive Assistant System represents an approach to ensure the highest degree possible of situation awareness of the flight deck crew as well as a satisfactory workload level. This generic approach to mission management and crew assistance for military aircraft has been realised in different application domains such as military transport and air-to-ground attack. Even applications in the domain of unmanned aerial vehicles (UAV) are in reach. This paper mainly covers two state-of-the-art research and development activities: the Crew Assistant Military Aircraft as a functional prototype for the air transport application and the Tactical Mission Management System as an experimental solution for air-to-ground attack aircraft. The paper gives details on the prototype development and the experimental evaluation.
Author
Military Operations; Flight Management Systems; Prototypes; Situational Awareness; Decision Support Systems

20020031785 General Accounting Office, Washington, DC USA
Report to the Subcommittee on Space and Aeronautics, Committee on Science, House of Representatives. NASA: Better Mechanisms Needed for Sharing Lessons Learned
Jan. 2002; 58p; In English
Report No.(s): PB2002-102874; GAO-02-195; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
At the request of the Chairman and Ranking Minority Member, Subcommittee on Space and Aeronautics, House Committee on Science, GAO assessed whether NASA has adequate mechanisms in place to ensure that past lessons learned from mission failures are being applied. Specifically, GAO (1) identified the policies, procedures, and systems NASA has in place for lessons learning, (2) assessed how effectively these policies, procedures, and systems facilitate lessons learning, and (3) determined whether further efforts are needed to improve lessons learning. NASA's procedures and guidelines require that program and project managers review and apply lessons learned from the past throughout a programs or projects life cycle and to document and submit any significant lessons to the agencys Lessons Learned Information System (LLIS) in a timely manner.
NTIS
NASA Programs; Space Shuttles; Information Systems; Life (Durability)

20020031786 General Accounting Office, Washington, DC USA
Report to Congressional Committees. Science and Technology: Air Force's Planning Process Meets Statutory Requirement
Feb. 2002; 24p; In English
Report No.(s): PB2002-102880; GAO-02-273; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Congress has also been concerned about the Air Force's declining investment in science and technology. The National Defense Authorization Act for Fiscal Year 2001 requires that the secretary of the Air Force review the long-term challenges and short-term objectives of the Air Force's science and technology programs. The act further requires that the review assess the budgetary resources currently used and those needed to adequately address the challenges and objectives. The act also requires that we assess the extent to which the Air Force has complied with the provisions of the act and report to the Congress on the results of our review. In discussions with your offices, we agreed to focus our review on whether the Air Force complied with the criteria specified in the act and the process-related requirements of the act and not on the technical merits of the research projects identified. This report addresses the three primary areas specified in the act: long-term challenge identification and planning, short-term objective identification and planning, and program and budgetary resource assessment.
NTIS
Defense Program; Military Operations; Congressional Reports

20020031924 Wayne State Univ., Detroit, MI USA
Efficiency Improvements via Monitoring in Medical Group Practice. Abstract and Executive Summary of Dissertation
Molinari, N.; Dec. 2001; 16p; In English
Report No.(s): PB2002-102309; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This dissertation tests the hypothesis that medical partnerships can effectively respond to moral hazard by monitoring their members. While it has long been believed that partnerships are inefficient due to inability to control the opportunism of members, widespread occurrence of this organizational form belies that belief. This project examines the methods used by firms to address potential shirking and the relative effectiveness of these methods. A partnership model is developed which describes the decision-making process in medical groups. The model was inspired by Lee (1990) and Kandel and Lazear (1992), with the structure adapted from that in Gaynor and Gertler (1995). To evaluate the impact of group structure on choice of compensation

scheme, surveillance system, and technical efficiency, empirical analysis is performed using data collected by the Medical Group Management Association.
NTIS
Decision Making; Hypotheses; Surveillance

20020032584 General Accounting Office, Accounting and Information Management Div., Washington, DC USA
Biomedical Research. HHS Direction Needed to Address Financial Conflicts of Interest (Report to Congress)
Nov. 2001; 50p; In English
Report No.(s): PB2002-102013; GAO-02-89; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Recent allegations that conflicts of interest may have affected the integrity of biomedical research and led to harming human research //objects have heightened concerns about the financial relationships between individual //search investigators or their research institutions and private industry.
NTIS
Congressional Reports; Research Management; Government/Industry Relations

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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.

20020027688 Woods Hole Oceanographic Inst., MA USA
4DGeoBrowser: A Web-Based Data Browser and Server for Accessing and Analyzing Multi-Disciplinary Data
Lerner, Steven; Maffei, Andrew; Oct. 2001; 70p; In English; Original contains color images
Report No.(s): AD-A398546; WHOI-2001-13; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
This report describes the 4DGeoBrowser software system. The GeoBrowser is a web-based application developed at the Woods Hole Oceanographic Institution by Steven Lemer and Andrew Maffei. It has been designed with the goal of creating, accessing, and analyzing repositories of oceanographic datasets that have been generated by investigators in differing scientific disciplines. Once the information is loaded onto a Geobrowser server the investigator-user is able to login to the website and use a set of data access and analysis tools to search, plot, and display this information. GeoBrowser servers are also capable of processing commands that are submitted remotely via HTTP URLs or email. Scientists are able to use this capability to make calls to the GeoBrowser server and generate click-able maps, tables of URLs, and customized HTML pages. These can then be used to enhance websites associated with scientific projects. Examples of supporting scientific website functionality that includes time series plotting, data delivery by email, geo-spatial plotting of interdisciplinary data, map-based search capabilities and other functionality are presented in this report. The report includes examples of GeoBrowser application websites, a user manual, and a reference guide. In addition, the concept of Electronic Index Cards (EICs) is presented.
DTIC
Information Retrieval; Document Markup Languages; Time Series Analysis

20020027697 Geo-Centers, Inc., Newton, MA USA
Automated Data Management for Warfighter Physiologic Status Monitoring
Buller, Mark J.; Siegel, Rob M.; Vaillette, Gary P.; Meyers, Debra; Matthew, William T.; Feb. 2002; 78p; In English; Prepared in collaboration with Geo-Centers, Inc., Newton, MA
Report No.(s): AD-A398541; USARIEM-TR-T-02/12; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
The Warfighter Physiological Status Monitoring (WPSM) program produces millions of data points per field study. The effective utilization of this growing collection of very large time series data sets is crucial for achieving the scientific goals of the WPSM program. Currently available object-relational database systems do not deal well with either temporal or time series data, making the development of a suitable system costly, time consuming, and difficult. A highly automated data management solution is described here which allows investigators rapid and easy access to pertinent and interesting subsets of data. The approach uses object-oriented methods and the Extensible Markup Language (XML), a World Wide Web (WWW) standard for information exchange, to standardize field study data in an extensible way. Rather than using a full-scale object-relational database management system, an XML file archive was developed. A client-server based application was engineered to provide a generic interface to the WPSM XML data archive, and to provide a simple to use graphical user interface. The complete archive and system

of software was used in four different applications and proved successful in its goal of automating the collection, archiving and access of data.
DTIC
Automation; Data Management; Data Base Management Systems; Data Acquisition; Document Markup Languages

20020027714 Government Printing Office, Washington, DC USA
GPO ACCESS: Keeping America Informed ***Biennial Report***
Dec. 31, 2001; 64p; In English
Report No.(s): PB2002-101862; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
In the past two years, GPO Access has remained one of the leading online sources of free, official Government information and the only such system mandated by law. Its publicly available resources, covering all three branches of Government, have grown to encompass more than 2,200 databases through over 80 applications, including the popular Congressional Record, Federal Register, and Code of Federal Regulations. As of December 2001, the Web site provided access to more than 130,000 titles on Government Printing Office (GPO) servers and over 94,000 additional titles through links to other Federal agency Web sites. To measure GPOs success in disseminating electronic Government information, the number of document retrievals by users is monitored. Recent statistics indicate that GPO Access fulfills approximately 31 million document retrievals per month, with a total of more than 355 million retrievals during fiscal year 2001 alone. The report provides statistical and descriptive information on GPO Access.
NTIS
Regulations; Information Systems; Congressional Reports; Information Dissemination

20020028162 National Academy of Sciences - National Research Council, Washington, DC USA
Resolving Conflicts Arising from the Privatization of Environmental Data
Gilbert, Freeman; Chameides, William L.; Jan. 2001; 108p; In English
Contract(s)/Grant(s): 50-DKNA-7-90052
Report No.(s): AD-A398647; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
Reliable collections of science-based environmental information are vital for many groups of users and for a number of purposes. For example, electric utility companies predict demand during heat waves, structural engineers design buildings to withstand hurricanes and earthquakes, water managers monitor each winter's snow pack, and farmers plant and harvest crops based on daily weather predictions. Understanding the impact of human activities on climate, water, ecosystems, and species diversity, and assessing how natural systems may respond in the future are becoming increasingly important for public policy decisions. Environmental information systems gather factual information, transform it into information products, and distribute the products to users. Typical uses of the information require long-term consistency; hence the operation of the information system requires a long-term commitment from an institution, agency, or corporation. The need to keep costs down provides a strong motivation for creating multi-purpose information systems that satisfy the scientific, commercial and operational requirements, rather than systems that address narrow objectives. This report focuses on such shared systems.
DTIC
Information Systems; Data Management; Problem Solving; Design Analysis

20020028363 Academy for Educational Development, Inc., Washington, DC USA
Gender, Information Technology, and Developing Countries: An Analytical Study
Hafkin, N.; Taggart, N.; Jun. 2001; 126p; In English
Report No.(s): PB2002-102647; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
Information technology (IT) has become a potent force in transforming social, economic, and political life globally. Without its incorporation into the information age, there is little chance for countries or regions to develop. More and more concern is being shown about the impact of those left on the other side of the digital divide--the division between the information 'haves' and 'have nots'. Most women within developing countries are in the deepest part of the divide--further removed from the information age than the men whose poverty they share. If access to and use of these technologies is directly linked to social and economic development, then it is imperative to ensure that women in developing countries understand the significance of these technologies and use them. If not, they will become further marginalized from the mainstream of their countries and of the world. It is essential that gender issues be considered early in the process of the introduction of information technology in developing countries so that

gender concerns can be incorporated from the beginning and not as a corrective afterwards. Many people dismiss the concern for gender and IT in developing countries on the basis that development should deal with basic needs first.
NTIS
Information Systems; Developing Nations

20020029439 Societa Italiana Avionica S.p.A., Turin, Italy
Future Trends and Developments
Crovella, Luigi, Societa Italiana Avionica S.p.A., Italy; Tactical Decision Aids and Situational Awareness; January 2002, pp. 6-1 - 6-2; In English; Also announced as 20020029433; Copyright Waived; Avail: CASI; A01, Hardcopy

The various technical items described during the Lecture Series were covering modern Information Technology applications and achievements in the Situational Awareness and Decision Aids Systems. The Authors unanimously agreed in suggesting improvements for the future in what follows: (1) Decision Superiority; (2) Beyond Awareness; (3) Battlespace Dominance; and (4) Human and Machine Integration.
Author
Decision Support Systems; Situational Awareness; Technology Utilization; Trends

20020029883 Center for Mathematics and Computer Science, Amsterdam Netherlands
Cuypers: A Semi-Automatic Hypermedia Generation System
vanOssenbruggen, J. R.; Cornelissen, F. J.; Geurts, J. P. T. M.; Rutledge, L. W.; Hardman, L.; Dec. 31, 2000; 26p; In English
Report No.(s): PB2002-103666; INS-R0025; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The report describes the architecture of Cuypers, a system supporting second and third generation Web-based multimedia. First generation Web-content encodes information in handwritten (HTML) Web pages. Second generation Web content generates HTML pages on demand, e.g. by filling in templates with content retrieved dynamically from a database or transformation of structured documents using style sheets (e.g. XSLT). Third generation Web pages will make use of rich markup (e.g. XML) along with metadata (e.g. RDF) schemes to make the content not only machine readable but also machine processable a necessary pre-requisite to the Semantic Web. While text-based content on the Web is already rapidly approaching the third generation, multimedia content is still trying to catch up with second generation techniques. Multimedia document processing has a number of fundamentally different requirements from text which make it more difficult to incorporate within the document processing chain. In particular, multimedia transformation uses different document and presentation abstractions, its formatting rules cannot be based on text-flow, it requires feedback from the formatting back-end and is hard to describe in the functional style of current style languages. We state the requirements for second generation processing of multimedia and describe how these have been incorporated in our prototype multimedia document transformation environment, Cuypers. The system overcomes a number of the restrictions of the text-flow based tool sets by integrating a number of conceptually distinct processing steps in a single runtime execution environment. We describe the need for these different processing steps and describe them in turn (semantic structure, communicative device, qualitative constraints, quantitative constraints, final form presentation), and illustrate our approach by means of an example. We conclude by discussing the models and techniques required for the creation of third generation multimedia content.
NTIS
Document Markup Languages; Data Management; Feedback; Data Bases; Multimedia

20020030200 Center for Mathematics and Computer Science, Amsterdam Netherlands
Hypermedia and the Semantic Web: A Research Agenda
van Ossenbruggen, J. R.; Hardman, H. L.; Rutledge, L.; May 31, 2001; 20p; In English
Report No.(s): PB2002-103671; INS-R0105; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Until recently, the Semantic Web was little more than a name for the next generation Web infrastructure as envisioned by its inventor, Tim Berners-Lee. Now, with the introduction of XML and RDF, and new developments such as RDF Schema and DAML+OIL, the Semantic Web is rapidly taking shape. In this paper, we first give an overview of the state-of-the-art in Semantic Web technology, the key relationships with traditional hypermedia research, and a comprehensive reference list to various sets of literature (Hypertext, Web and Semantic Web). The core of the paper presents a research agenda by describing the open research issues in the development of the Semantic Web from the perspective of hypermedia research.
NTIS
Semantics; World Wide Web; Shapes; Hypertext

20020030203 NASA Langley Research Center, Hampton, VA USA

NASA Patent Abstracts Bibliography: A Continuing Bibliography, Supplement 60

January 2002; 71p; In English

Report No.(s): NASA/SP-2002-7039/SUPPL60; NAS 1.21:7039/SUPPL60; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Several thousand inventions result each year from the aeronautical and space research supported by the National Aeronautics and Space Administration. The inventions having important use in government programs or significant commercial potential are usually patented by NASA. These inventions cover practically all fields of technology and include many that have useful and valuable commercial application. NASA inventions best serve the interests of the USA when their benefits are available to the public. In many instances, the granting of nonexclusive or exclusive licenses for the practice of these inventions may assist in the accomplishment of this objective. This bibliography is published as a service to companies, firms, and individuals seeking new, licensable products for the commercial market. The NASA Patent Abstracts Bibliography is a semiannual NASA publication containing comprehensive abstracts of NASA owned inventions covered by U.S. patents. The citations included in the bibliography arrangement of citations were originally published in NASA's Scientific and Technical Aerospace Reports (STAR) and cover STAR announcements made since May 1969. The citations published in this issue cover the period July 2001 through December 2001. This issue includes 10 major subject divisions separated into 76 specific categories and one general category/division. (See Table of Contents for the scope note of each category, under which are grouped appropriate NASA inventions.) This scheme was devised in 1975 and revised in 1987 in lieu of the 34 category divisions which were utilized in supplements (01) through (06) covering STAR abstracts from May 1969 through January 1974. Each entry consists of a STAR citation accompanied by an abstract and, when appropriate, a key illustration taken from the patent or application for patent. Entries are arranged by subject category in ascending order. A typical citation and abstract presents the various data elements included in most records cited. This appears after the table of contents.

Author

NASA Programs; Inventions; Technology Utilization; Patents

20020030286 Air Command and Staff Coll., Maxwell AFB, AL USA

The Integration of Operations and Intelligence Getting Information to the Warfighter

Miller, Mark E.; Mar. 1997; 46p; In English; Original contains color images

Report No.(s): AD-A398452; AU/ACSC/0362/97-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Getting combat information in a timely manner from the stovepipes of the intelligence world to the operators that require it has been a problem for years. The process is not one that will improve unless both the Operations and Intelligence communities make a concerted effort to understand each other better. In this paper I will use a combination of primary and secondary sources, along with personal interviews, to establish a historic recap of both good and bad examples of Ops/Intel integration. I will then examine the current intelligence cycle and attempt to identify critical links between it and the operations world. These links will be the key in creating a synergy between Ops and Intel that is critical if the two disciplines are to be integrated effectively. The goal of the cycle should be to ensure that the final intelligence product accomplishes the objective it was initially intended for; that is, get pertinent information to the warfighter in a timeframe and format for him to exploit it. At this point it will become apparent that there are certain roadblocks that must be overcome in order to accomplish the previously stated goal. Identifying these roadblocks is only half of the problem. Offering reasonable solutions is the other half. Cost-effective solutions aimed at dismantling some of the Ops/Intel integration roadblocks are offered. In this age of shortened time-lines and information overload, the Ops/Intel team that works best together will own the information high ground. This is an objective that is critical to success on the battlefield of tomorrow.

DTIC

Military Operations; Information Transfer; Reconnaissance; Management

20020030818 Ontek Corp., Marietta, GA USA

MEREOS ***Final Report, 9 Jun. 1995-18 Jul. 2000***

Dement, Charles W.; Mairet, Charles E.; DeWitt, Stephen E.; Slusser, Robert W.; Jun. 2001; 109p; In English; Original contains color images

Contract(s)/Grant(s): F33615-95-C-5519; AF Proj. 095

Report No.(s): AD-A397558; ONTEK/TR-01/002; AFRL-ML-WP-TR-2001-4116; No Copyright; Avail: Defense Technical Information Center (DTIC)

The MEREOS program is a manufacturing technology program of the United States Air Force Research Laboratory, Materials and Manufacturing Directorate, Manufacturing Technology Division (AFRL/MLM) funded under contract

F33615-95-C-5519. The two program objectives were first to identify the root causes of the problem of multiple BOM reconciliation and define the requirements for a solution, and second, to prove, via demonstration, the feasibility of developing a system to implement that solution. The key information system and enterprise process capabilities required to solve this and other related product representation problems were identified as a result of an extensive and formal needs and requirements analysis. Software demonstrating solution feasibility was also developed. Elements of a new aerospace and defense operating system for implementing these enterprise process capabilities were designed.
DTIC
Feasibility Analysis; Information Systems; Computer Programs

20020031781 Agency for International Development, Center for Democracy and Goverance, Washington, DC USA
Case Tracking and Management Guide
Sep. 2001; 48p; In English
Report No.(s): PB2002-102761; AID-PN-ACM-001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Case tracking and management (CTM) systems are critical to the effectiveness and efficiency of judiciaries. They bring transparency to a court's operations, reducing the opportunities for corruption and ensuring accountability. The challenge for USAID democracy officers and local stakeholders is to design and implement an intervention that is responsive to well-defined local needs and priorities, feasible, affordable initially, and sustainable. This manual provides guidance in meeting that challenge. It draws on a growing body of experience in CTM system improvement initiatives that has generated important information about how to do the job well and what pitfalls to avoid.
NTIS
Manuals; Information Systems; Management Systems; Priorities

20020031782 National Center for Injury Prevention and Control, Atlanta, GA USA
Data Elements for Emergency Department Systems. Release 1.0
1997; 278p; In English
Report No.(s): PB2002-102790; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche
Hospital emergency departments (EDs) in the USA serve a unique role in health care delivery. They are the only institutional providers mandated by federal law to evaluate anyone seeking care. They are expected at least to stabilize the most severely ill and injured patients, and they are primary care providers for vast numbers of people who lack access to a regular source of health care services. Because of the case mix and volume of patients they treat, the estimated 4,800 EDs in the USA are well positioned to provide data for public health surveillance, community risk assessment, research, education, training, quality improvement, health care administration and finance, and other uses. However, variations in the way that data are entered in different ED record systems, and even within individual systems, impede the use of ED records for patient care and deter their reuse for multiple secondary applications. The content and format of records differ from site to site, and incompatibilities exist in many data definitions and codes. Further standardization is needed, particularly if the rapidly accelerating pace of computerization is to facilitate rather than complicate aggregation and analysis of data from multiple EDs. Several related initiatives are under way in the USA to foster more uniform emergency care data. The Centers for Disease Control and Prevention's (CDC) National Center for Injury Prevention and Control (NCIPC) is coordinating one of these initiatives - a public-private partnership that has developed recommended specifications for many of the observations, actions, instructions, and conclusions that are entered in ED records. Data Elements for Emergency Department Systems, Release 1.0 (DEEDS) is the initial product of this broad-based, collaborative effort.
NTIS
Data Management; Medical Services; Public Health

20020031783 General Accounting Office, Washington, DC USA
Report to Congressional Committees. Human Services Integration: Results of a GAO Cosponsored Conference on Modernizing Information Systems
Jan. 2002; 48p; In English
Report No.(s): PB2002-102870; GAO-02-121; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
To assist congressional oversight and inform our work in the area of information systems for human services, GAO and the Nelson A. Rockefeller Institute of Government established a working group of experts from diverse organizations in March 1998. The group met eight times over 3 years, culminating in a conference held in Reston, Virginia, on June 28 and 29, 2001, that focused on the critical issues that states face in developing information systems to support objectives such as integrated service delivery and performance monitoring across human services programs. Specifically, the conference examined (1) the capabilities of state

information systems to meet information needs for welfare reform, (2) initiatives undertaken by states to improve their information systems, (3) challenges to systems modernization, and (4) strategies to improve state information systems and facilitate service integration. About 70 participants attended the conference, including congressional staff; federal, state, and local program and information technology managers; welfare researchers; information system contractors; and representatives of private, non-profit foundations. The conference featured a mix of paper presentations and discussions and the development of ideas by participants in small discussion groups. This report summarizes the conference proceedings.
NTIS
Information Systems; Systems Integration; Conferences

20020031795 NASA Langley Research Center, Hampton, VA USA
Evaluating the Effectiveness of the 1999-2000 NASA CONNECT Program
Pinelli, Thomas E., NASA Langley Research Center, USA; Frank, Kari Lou, College of William and Mary, USA; February 2002; 71p; In English
Contract(s)/Grant(s): RTOP 772-90-57-01
Report No.(s): NASA/TM-2002-211447; NAS 1.15:211447; L-18148; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

NASA CONNECT is a standards-based, integrated mathematics, science, and technology series of 30-minute instructional distance learning (satellite and television) programs for students in grades 6-8. Each of the five programs in the 1999-2000 NASA CONNECT series included a lesson, an educator guide, a student activity or experiment, and a web-based component. In March 2000, a mail (self-reported) survey (booklet) was sent to a randomly selected sample of 1,000 NASA CONNECT registrants. A total of 336 surveys (269 usable) were received by the established cut-off date. Most survey questions employed a 5-point Likert-type response scale. Survey topics included (1) instructional technology and teaching, (2) instructional programming and technology in the classroom, (3) the NASA CONNECT program, (4) classroom use of computer technology, and (5) demographics. About 73% of the respondents were female, about 92% identified ”classroom teacher” as their present professional duty, about 90% worked in a public school, and about 62% held a master’s degree or master’s equivalency. Regarding NASA CONNECT, respondents reported that (1) they used the five programs in the 1999-2000 NASA CONNECT series; (2) the stated objectives for each program were met (4.54); (3) the programs were aligned with the national mathematics, science, and technology standards (4.57); (4) program content was developmentally appropriate for grade level (4.17); and (5) the programs in the 1999-2000 NASA CONNECT series enhanced/enriched the teaching of mathematics, science, and technology (4.51).
Author
NASA Programs; Education; Mathematics; Telecommunication; Computer Techniques

20020031923 NASA Langley Research Center, Hampton, VA USA
Design and Development of a Virtual Facility Tour Using iPIX(TM) Technology
Farley, Douglas L., NASA Langley Research Center, USA; February 2002; 46p; In English; Original contains color illustrations
Contract(s)/Grant(s): RTOP 242-82-76-10
Report No.(s): NASA/TM-2002-211435; L-18126; NAS 1.15:211435; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The capabilities of the iPIX virtual tour software, in conjunction with a web-based interface create a unique and valuable system that provides users with an efficient virtual capability to tour facilities while being able to acquire the necessary technical content is demonstrated. A users guide to the Mechanics and Durability Branch’s virtual tour is presented. The guide provides the user with instruction on operating both scripted and unscripted tours as well as a discussion of the tours for Buildings 1148, 1205 and 1256 and NASA Langley Research Center. Furthermore, an indepth discussion has been presented on how to develop a virtual tour using the iPIX software interface with conventional html and JavaScript. The main aspects for discussion are on network and computing issues associated with using this capability. A discussion of how to take the iPIX pictures, manipulate them and bond them together to form hemispherical images is also presented. Linking of images with additional multimedia content is discussed. Finally, a method to integrate the iPIX software with conventional HTML and JavaScript to facilitate linking with multi-media is presented.
Author
Multimedia; Object-Oriented Programming; Virtual Reality; User Manuals (Computer Programs); Tourism

20020032330 Iowa State Univ. of Science and Technology, Ames, IA USA

Stochastic Characterizations for Signals and Systems Associated with Quasi-Periodic Systems ***Final Report, 1 Feb. 1998-31 Jan. 2001***

Sherman, Peter J.; Jan. 2001; 16p; In English

Contract(s)/Grant(s): F49620-98-0252

Report No.(s): AD-A398780; AFRL-SR-BL-TR-02-0035; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this funded research was to complete the development of a fault diagnosis system for rotating machinery, which was initiated under a previous AFOSR grant (F49620-95-1-0090). The focus of the proposed research was strongly linked to the accomplishments achieved to date. Because the value of such a system is ultimately gauged by its applicability and utility in real world settings, a major opponent of the research results contained herein center on real world issues which violate many of the assumptions used to develop advanced a signal analysis methods. Specific technical outcomes related to this research include: (1) Characterization of the nature of 'real-world' sinusoids associated with rotating machinery; (2) Development of improved periodic time/frequency analysis tools for quasi-periodic processes; and (3) Implementation of theoretical statistics derived under previous funding in the development of a multi-resolution, intelligent methodology for estimating the spectral information associated with mixed random processes. We have also aggressively pursued establishment of research ties with US and foreign industries and academic institutions to evaluate the utility of the above results and to guide the direction of future research and funding opportunities. These efforts are documented in this report. We believe that they are valuable not only for transitions of research results obtained under this grant, but also for securing future support from other agencies.

DTIC

Error Analysis; Signal Analysis; Stochastic Processes

20020032336 Duke Univ., Dept. of Physics, Durham, NC USA

Support for International Free Electron Laser Conference ***Final Report, for 1 Aug. 2000-31 Jul. 2001***

Litvinenko, Vladimir; Dec. 28, 2001; 6p; In English

Contract(s)/Grant(s): F49620-00-1-0346

Report No.(s): AD-A398812; AFRL-SR-BL-TR-02-0032; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This grant was to sponsor the 22nd International Free Electron Laser Conference (FEL'2000) and 7th FEL User Workshop, which were held at Duke Washington Inn (off-campus) on August 14- 18, 2000. The objectives were: 1. to hold successful International FEL Conference at Duke University; 2. provide support for graduate students to attend the conference; 3. provide financial assistance to scientists involved in the MFEL program; 4. attract attention of potential users.

DTIC

Conferences; Free Electron Lasers

20020032586 Geological Survey, Reston, VA USA

Policy and Procedures for the Management and Archival Storage of Data Collected for Hydrologic Investigations, U.S. Geological Survey, Indiana District

Martin, J. D.; Cohen, D. A.; 1993; 30p; In English

Report No.(s): PB2002-102789; USGS-OFR-94-61; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The report describes the policy and procedures used by the Indiana District to manage and store data collected during hydrologic investigations. It is the policy of the Indiana District that data collected to meet the objectives of projects for hydrologic investigations be documented, organized, and archived in a manner that (1) facilitates retrieval, evaluation, and use by District personnel and others; and (2) enables verification of data contained in all reports and computer data bases.

NTIS

Data Management; Geological Surveys; Data Bases

83
ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20020027702 Economic Development Administration, Washington, DC USA
Internet-Based Economic Development for Rural Communities. Reviews of Economic Development Literature and Practice: No. 9
Min, J.; Sukhumaran, B.; Varghese, S.; 2001; 35p; In English
Report No.(s): PB2002-101946; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

In recent years, due to high-speed Internet technologies, economic activities and opportunities via the Internet in rural communities have been greatly expanded. On the other hand, such technologies necessarily involve considerable investments of money and time, accompanied by rapid technological advances of a high degree of complexity. Under these circumstances, this study comprehensively investigated economic development via the Internet in rural communities, based on available published information. The report first examines economic opportunities and compares various technology options in broadband deployment. It then discusses how broadband deployment options can be objectively and quantitatively evaluated for adoption. It also investigates relevant current practices in rural communities, which can help practitioners appreciate the successes and failures of broadband deployment currently carried out. Finally, for practitioners it presents a list of knowledge requirements for successful broadband deployment and other policy implications. Given the economic opportunities, technology options, decision support models, case studies, numerous examples, key debate issues, and policy implications described in this report, the authors strongly believe that practitioners will better appreciate the benefits as well as the complexity and risk of broadband deployment for rural economic development.

NTIS
Broadband; Deployment; Economic Development; Economics; Internets

20020027706 Bureau of the Census, Economics and Statistics Administration, Washington, DC USA
Economic Census, Rhode Island. Manufacturing: Geographic Area Series
May 2000; 144p; In English
Report No.(s): PB2002-102420; EC97M31A-RI; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The economic census is the major source of facts about the structure and functioning of the Nation's economy. It provides essential information for government, business, industry, and the general public. The economic census furnishes an important part of the framework for such composite measures as the gross domestic product estimates, input/output measures, production and price indexes, and other statistical series that measure short-term changes in economic conditions. Specific uses of economic census data include the following: Policymaking agencies of the Federal Government use the data monitor economic activity and assess the effectiveness of policies; State and local government use the data to assess business activities; Trade associations study trends in their own and competing industries; Individual businesses use the data to locate potential markets and to analyze their own production and sales performance relative to industry or area average. Data from the 1997 Economic Census are published primarily on the basis of the North American Industry Classification System (NAICS).

NTIS
Census; Economic Factors; Economics; Trends; Economic Analysis

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

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

20020027354 National Defence Research Establishment, Div. of Defence Analysis, Stockholm, Sweden
Inner Circle: The Influence of the Russian Security Council *Den Innersta Kretsen: Det Ryska Saekerhetsradets Inflytande*
Vendil, C.; Dec. 2000; 78p; In Swedish
Report No.(s): PB2002-101933; FOA-R-00-01701-170-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Shortly after Vladimir Putin had taken office as president of the Russian Federation, it became clear that the Russian Security Council was to play a significantly more important role in Russian security policy. Both foreign policy and defense policy have been formulated primarily in the Security Council. The secretary of the Security Council, Sergei Ivanov, has been given an

prominent position in decision-making. An examination of the role of the Security Council during its decade of existence, reveals that this was not always the case. The influence of the Security Council has varied according to which role the president has accorded to it. A good indicator of the influence of the Security Council in Russian politics has been the influence that its secretary enjoys with the president. The Security Council is a three-dimensional institution consisting of the council and its members, its apparatus or staff, which prepares council meetings and collects information, and its interdepartmental commissions, which consist of representatives from ministries and government institutions.
NTIS
Security; Management Systems

85
TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see 03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion. For specific technology transfer applications see also the category where the subject is treated.

20020027990 Federal Highway Administration, Washington, DC USA
Sustainable Transportation Practices in Europe
Nov. 2001; 56p
Report No.(s): PB2002-102221; FHWA-PL-02-006; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
In the USA, the transportation community has shown an increasing interest in sustainable transportation and its linkages to land use and urban development patterns, economic growth, environmental impacts, and social equity. In addressing this interest, many U.S. transportation agencies are re-examining their policies, planning approaches, and evaluation methods and are considering changes to every aspect of practice, from the materials and designs used in construction to the kinds of alternatives considered for implementation. Federal, State, and local agencies as well as private organizations are working to translate the broad goals of sustainability into specific transportation policies, objectives, and programs. This international scanning review was undertaken to examine how other developed countries are addressing sustainable transportation issues.
NTIS
Transportation; Urban Development; Economic Impact; Land Use

88
SPACE SCIENCES (GENERAL)

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

20020033023 Universities Space Research Association, Columbia, MD USA
Space Research, Education, and Related Activities in the Space Sciences ***Annual Report, 1 Oct. 2000 - 30 Sep. 2001***
Black, David, Universities Space Research Association, USA; [2002]; 27p; In English
Contract(s)/Grant(s): NCC5-356; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Universities Space Research Association received an award of Cooperative Agreement NCC5-356 on September 29, 1998. The mission of this activity, known as the Cooperative Program in Space Sciences (CPSS), is to conduct space science research and leading-edge instrumentation and technology development, enable research by the space sciences communities, and to expedite the effective dissemination of space science research, technology, data, and information to the educational community and the general public. to fulfill this mission, USRA recruits and maintains a staff of scientific researchers, operates a series of guest investigator facilities, organizes scientific meetings and workshops, and encourages various interactions with students and university faculty members.
Author
Aerodynamics; Aerospace Engineering; Research and Development

89
ASTRONOMY

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

20020028395 NASA Ames Research Center, Moffett Field, CA USA
Kuiper Airborne Observatory's Telescope Stabilization System: Disturbance Sensitivity Reduction Via Velocity Loop Feedback
Lawrence, David P., Sverdrup Technology, Inc., USA; Tsui, K. C., NASA Ames Research Center, USA; Tucker, John, NASA Ames Research Center, USA; [1995]; 1p; In English; ISA 1995 Technical Conference and Exhibition, 1-6 Oct. 1995, New Orleans, LA, USA; Sponsored by Instrument Society of America, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In July of 1994 the Kuiper Airborne Observatory's (KAO) Telescope Stabilization System (TSS) was upgraded to meet performance goals necessary to view the Shoemaker-Levy 9 comet collision with Jupiter. The KAO is a modified C-141 Aircraft supporting a 36 inch Infrared telescope used to gather and analyze astronomical data. Before the upgrade, the TSS exhibited approximately a 10 arc-second resolution pointing accuracy. The majority of the inaccuracy was attributable to aircraft vibration and wind buffeting entering through the aircraft's telescope door opening; in other words, the TSS was overly sensitive to external disturbances. Because of power limitations and noise requirements, improving the pointing accuracy of the telescope required more sophistication than simply raising the bandwidth as some classical control strategies might suggest. Instead, relationships were developed between the disturbance sensitivity and closed loop transfer functions. These relationships suggested that employing velocity feedback along with an increase in current loop gain would dramatically improve the pointing resolution of the TSS by decreasing the control system's sensitivity to external disturbances. With the implementation of some classical control techniques and the above philosophy, the KAO's TSS's resolution was improved to approximately 2-3 arc-seconds.
Author
Kuiper Airborne Observatory; Stabilization; Infrared Telescopes; Resolution

20020028396 NASA Ames Research Center, Moffett Field, CA USA
SOFIA: The Next Generation Airborne Observatory
Dunham, Edward; [1995]; 1p; In English, 21 Apr. 1995, Flagstaff, AZ, USA
Contract(s)/Grant(s): RTOP 352-03-03; No Copyright; Avail: Issuing Activity; Abstract Only

SOFIA, the Stratospheric Observatory For Infrared Astronomy, will carry a 2.5 meter telescope into the stratosphere on 160 7.5 hour flights per year. At stratospheric altitudes SOFIA will operate above 99% of the water vapor in the Earth's atmosphere, allowing observation of wide regions of the infrared spectrum that are totally obscured from even the best ground-based sites. Its mobility and long range will allow worldwide observation of ephemeral events such as occultations and eclipses. SOFIA will be developed jointly by NASA and DARA, the German space agency. It has been included in the President's budget request to Congress for a development start in FY96 (this October!) and enjoys strong support in Germany. This talk will cover SOFIA's scientific goals, technical characteristics, science operating plan, and political status.
Author
Sofia (Airborne Observatory); Infrared Astronomy

20020028936 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Identifying EGRET Sources ***Annual Report, 1 Feb. 1999 - 31 Jan. 2002***
Schlegel, E., Smithsonian Astrophysical Observatory, USA; February 2002; 3p; In English
Contract(s)/Grant(s): NAG5-3697; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This project was awarded funding from the CGRO program to support ROSAT and ground-based observations of unidentified sources from data obtained by the EGRET instrument on the Compton Gamma-Ray Observatory. The critical items in the project are the individual ROSAT observations that are used to cover the 99% error circle of the unidentified EGRET source. Each error circle is a degree or larger in diameter. Each ROSAT field is about 30 deg in diameter. Hence, a number (>4) of ROSAT pointings must be obtained for each EGRET source to cover the field. The scheduling of ROSAT observations is carried out to maximize the efficiency of the total schedule. As a result, each pointing is broken into one or more sub-pointings of various exposure times. This project was awarded ROSAT observing time for four unidentified EGRET sources, summarized in the table. The column headings are defined as follows: 'Coverings' = number of observations to cover the error circle; 'SubPtg' = total number of sub-pointings to observe all of the coverings; 'Rec'd' = number of individual sub-pointings received to date; 'CompFlds' =

number of individual coverings for which the requested complete exposure has been received. Processing of the data can not occur until a complete exposure has been accumulated for each covering.
Derived from text
Exposure; Gamma Ray Astronomy; Identifying; Gamma Ray Sources (Astronomy)

20020029299 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Non-Radiative Shocks in the Cygnus Loop: H2 in HH2 Fluorescence or Collisions? ***Annual Report, 1 Nov. 2000 - 31 Jan. 2002***
Raymond, John C., Smithsonian Astrophysical Observatory, USA; February 2002; 1p; In English
Contract(s)/Grant(s): NAG5-9019; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Far Ultraviolet Spectroscopic Explorer (FUSE) observations at four positions across a faint H-alpha filament in the northern Cygnus Loop were carried out successfully. The O(VI) profiles were measured in the four spectra, and we are in the process of fitting them. We have constructed models for a rippled sheet of emission seen almost edge-on based on non-radiative shock wave models for the time-dependent ionization state of the gas behind the shock. The function that describes the rippled sheet geometry predicts the line-of sight velocity component, and we add thermal broadening for various assumed values of ion-ion and ion-electron equilibration. We then compute the radiative transfer in each of the O(VI) lines along the line of sight. Finally, we multiply by the transmission of the ISM using average O(VI) column densities. So far, it appears that partial thermal equilibration is required. Neither full equilibration nor total lack of equilibration seems to provide a workable model. The HH2 observations have not yet been obtained. FUSE has many targets in this region of the sky. We are hoping to get the observations in the spring if FUSE pointing stability allows.
Author
Fluorescence; Gas Ionization; Radiative Transfer; H Alpha Line

20020029621 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Exploring Asymmetries in Circumstellar Environments: Winds, Disks, and Things That Go Clump in the Light ***Final Report, 1 Mar. 1997 - 30 Sep. 2001***
Wood, Kenneth, Smithsonian Astrophysical Observatory, USA; February 2002; 3p; In English
Contract(s)/Grant(s): NAG5-6039; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The aim of the NASA LTSA Grant NAG5-6039 was to develop Monte Carlo radiation transfer techniques for use in the analysis of data from stellar systems that exhibit evidence for extended, non-spherical circumstellar environments. The broad applicability of the codes I have developed has opened many new research areas to me, as is reflected by the range of topics covered in the bibliography.
Author
Monte Carlo Method; Radiative Transfer; Data Processing; Star Formation; Stellar Winds

20020030023 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA
Solar System Research with the Spacewatch 1.8-m Telescope ***Final Report, 1 Dec. 1998 - 30 Nov. 2001***
McMillan, Robert S., Arizona Univ., USA; [2001]; 19p; In English
Contract(s)/Grant(s): NAG5-7854; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During this grant period, the 1.8-m Spacewatch telescope was put into routine operation to search for asteroids and comets ranging in location from near-Earth space to regions beyond the orbit of Neptune. All of these classes of objects can be detected simultaneously with our uniform scanning procedures. We are studying near Earth objects (NEOs), main belt asteroids, comets, Centaurs, and trans-Neptunian objects (TNOs), as well as the interrelationships of these classes and their bearing on the origin and evolution of the solar system. The Spacewatch 1.8-meter telescope is sensitive to V(mag) is less than 22.6 in sidereal scanning mode and is able to reach even fainter in longer 'staring' exposures, with a field of view 0.5 degrees square. These faint limits make the operation of the Spacewatch 1.8-m telescope complementary to asteroid surveys being done by other groups. Specifically, EAs smaller than 100 m in diameter and small main belt asteroids can be found, as well as more distant objects such as Centaurs/Scattered Disk Objects (SDOs) and TNOs. The 1.8-m telescope is also being used to do recoveries and astrometry of recently-discovered asteroids that subsequently become too faint for the other groups before good orbits are established.
Author
Asteroids; Near Earth Objects; Telescopes; Observation; Sky Surveys (Astronomy)

20020031247 Hawaii Univ., Inst. for Astronomy, Honolulu, HI USA

Participation in the Infrared Space Observatory (ISO) Mission ***Final Report, 17 May 1996 - 14 Aug. 2001***

Joseph, Robert D., Hawaii Univ., USA; [2002]; 8p; In English

Contract(s)/Grant(s): NAG5-3370; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

All the Infrared Space Observatory (ISO) data have been transmitted from the ISO Data Centre, reduced, and calibrated. This has been rather labor-intensive as new calibrations for both the ISOPHOT and ISOCAM data have been released and the algorithms for data reduction have improved. We actually discovered errors in the calibration in earlier versions of the software. However the data reduction improvements have now converged and we have a self-consistent, well-calibrated database. It has also been a major effort to obtain the ground-based JHK imaging, 450 micrometer and 850 micrometer imaging and the 1-2.5 micrometer near-infrared spectroscopy for most of the sample galaxies.

Derived from text

Calibrating; Data Reduction; Infrared Space Observatory (ISO); Data Bases

20020031249 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Development of Infrared Phase Closure Capability in the Infrared-Optical Telescope Array (IOTA) ***Final Report, 1 May 1997 - 31 Dec. 2001***

Traub, Wesley A., Smithsonian Astrophysical Observatory, USA; February 2002; 48p; In English

Contract(s)/Grant(s): NAG5-4900; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We completed all major fabrication and testing for the third telescope and phase-closure operation at the Infrared-Optical Telescope Array (IOTA) during this period. In particular we successfully tested the phase-closure operation, using a laboratory light source illuminating the full delay-line optical paths, and using an integrated-optic beam combiner coupled to our Picnic-detector camera. This demonstration is an important and near-final milestone achievement. As of this writing, however, several tasks yet remain, owing to development snags and weather, so the final proof of success, phase-closure observation of a star, is now expected to occur in early 2002, soon after this report has been submitted.

Derived from text

Fabrication; Infrared Telescopes; Control Systems Design

20020032742 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Constellation X-Ray Mission and Support ***Annual Report, 1 Aug. 2001 - 10 Jan. 2002***

Tananbaum, H., Smithsonian Astrophysical Observatory, USA; January 2002; 14p; In English

Contract(s)/Grant(s): NCC5-368; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report is a supplement to the Third Annual Report summarizing work performed by the Smithsonian Astrophysical Observatory (SAO) for NASA Goddard Space Flight Center (GSFC) under Cooperative Agreement NCC5-3681. The Agreement is entitled 'Constellation X-ray Mission Study and Support.' This supplementary report covers the period from October 1, 2001 through January 10, 2002. The report has been prepared and submitted to ensure that the Constellation-X Project Office at GSFC has current performance information needed to evaluate a proposed modified budget for FY02. That proposed budget is being submitted separately. SAO continues to perform work under the overall direction of Dr. Harvey Tananbaum, the SAO Principal Investigator for the program. Mr. Robert Rasche is the SAO Program Manager and is responsible for day-to-day program management at SAO and coordination with GSFC. The report summarizes the main areas of SAO activity. Most of the work has been done jointly with personnel from GSFC and Marshall Space Flight Center (MSFC). We describe SAO participation in these efforts. Under the Agreement, SAO performed work in seven major areas of activity. These areas related to: (1) Constellation X-ray Mission Facility Definition Team and Study Management; (2) Science Support; (3) Spectroscopy X-ray Telescope (SXT); (4) Systems Engineering; (5) Travel in Support of the Work Effort; and (6) In-house Management and Coordination.

Derived from text

Project Management; Systems Engineering; X Ray Telescopes; X Ray Astronomy

20020033036 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Constellation X-Ray Mission and Support ***Annual Report, 1 Oct. 2000 - 30 Sep. 2001***

Tananbaum, H., Smithsonian Astrophysical Observatory, USA; January 2002; 16p; In English

Contract(s)/Grant(s): NCC5-368; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is the Third Annual Report of work performed by the Smithsonian Astrophysical Observatory (SAO) for NASA Goddard Space Flight Center (GSFC) under Cooperative Agreement NCC5-3681. The Agreement is entitled 'Constellation X-ray Mission Study and Support.' Work performed through January 31, 2001 was reported in a supplement to the Second Annual Report. That supplemental report was submitted in order to obtain funding subsequent to March 2001 which has, as the result of

prior funding actions, become the de facto beginning of the funding year under the Agreement. This report covers the balance of the third year of the Agreement from February 1, 2001 through September 30, 2001. The Agreement as currently configured runs for two more years. When funding is significantly different from the originally approved amounts, SAO submits a revised budget. One such revision was submitted last year and was the basis for funding a portion of the work reported here. This report summarizes the main areas of SAO activity. Most of the work has been performed jointly with personnel from GSFC and Marshall Space Flight Center (MSFC). Consequently, we do not claim that such activities were carried out exclusively by SAO. Rather, we describe SAO participation in these efforts. Under the Agreement, SAO performed work in seven major areas of activity. These areas related to: (1) Constellation X-ray Mission Facility Definition Team and Study Management; (2) Science Support; (3) Spectroscopy X-ray Telescope (SXT); (4) Systems Engineering; (5) Travel; and (6) In-house Management and Coordination.
Derived from text
Systems Engineering; X Ray Telescopes; X Ray Astronomy; Systems Management

90
ASTROPHYSICS

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

20020027488 NASA Ames Research Center, Moffett Field, CA USA
Models of Fallback
Zahnle, Kevin, NASA Ames Research Center, USA; [1995]; 1p; In English; IAU Meeting on the Impact of Comet Shoemaker-Levy 9 with Jupiter, 8-12 May 1995, Baltimore, MD, USA; Sponsored by International Astronomical Union, Unknown
Contract(s)/Grant(s): RTOP 184-52-22-08; No Copyright; Avail: Issuing Activity; Abstract Only

The impact of a typical Shoemaker-Levy 9 fragment produced three light peaks as seen from Earth. The first peak is related to the entry of the fragment into the jovian atmosphere. The second peak occurs when the exploding fireball rises above Jupiter's limb into direct view from Earth. The third peak, much the brightest, occurs when the ejecta plume falls back on the atmosphere. Here we present a simple, highly idealized model of a ballistic plume, which we then use to fit the observed light curve of the R impact as recorded at Mauna Kea and Mt.Palomar. The nominal R fragment has diameter 500 m and mass 3x10(sup)13 g, with energy release of 5x10(sup)26 ergs. The largest events were about three times more energetic. These sizes agree with those deduced by Ashaug and Benz from the dynamics of tidal disruption. Chemical products of the reentry shock included the sulfur compounds S2, CS, and CS2. These were emplaced very high in the atmosphere (ca. 100 microbars). The yield of the reduced compounds CS and CS2, coupled with the apparent absence of the oxidized compounds SO and SO2, indicate that the explosions occurred above the jovian water clouds.
Author
Jupiter (Planet); Shoemaker-Levy 9 Comet; Mathematical Models; Sulfur Compounds

20020027523 NASA Ames Research Center, Moffett Field, CA USA
The Dripping Handrail Model: Transient Chaos in Accretion Systems
Young, Karl; Scargle, Jeffrey D.; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 399-30-00-08; No Copyright; Avail: Issuing Activity; Abstract Only

We define and study a simple dynamical model for accretion systems, the "dripping handrail" (DHR). The time evolution of this spatially extended system is a mixture of periodic and apparently random (but actually deterministic) behavior. The nature of this mixture depends on the values of its physical parameters - the accretion rate, diffusion coefficient, and density threshold. The aperiodic component is a special kind of deterministic chaos called transient chaos. The model can simultaneously exhibit both the quasiperiodic oscillations (QPO) and very low frequency noise (VLFN) that characterize the power spectra of fluctuations of several classes of accretion systems in astronomy. For this reason, our model may be relevant to many such astrophysical systems, including binary stars with accretion onto a compact object - white dwarf, neutron star, or black hole - as well as active galactic nuclei. We describe the systematics of the DHR's temporal behavior, by exploring its physical parameter space using several diagnostics: power spectra, wavelet "scalegrams," and Lyapunov exponents. In addition, we note that for large accretion rates the DHR has periodic modes; the effective pulse shapes for these modes - evaluated by folding the time series at the known period - bear a resemblance to the similarly- determined shapes for some x-ray pulsars. The pulsing observed in some of these systems may be such periodic-mode accretion, and not due to pure rotation as in the standard pulsar model.
Author
Astrophysics; Black Holes (Astronomy); Stellar Models; Dynamical Systems; Accretion Disks

20020027527 NASA Ames Research Center, Moffett Field, CA USA

The Production of Complex Organics from Interstellar Ices

Sandford, Scott A., NASA Ames Research Center, USA; Allamandola, Louis, NASA Ames Research Center, USA; Bernstein, Max, NASA Ames Research Center, USA; Deamer, David, California Univ., USA; Dworkin, Jason, NASA Ames Research Center, USA; Zare, Richard, Stanford Univ., USA; [2001]; 1p; In English; 198th Meeting of the American Astronomical Society, 3-7 Jun. 2001, Pasadena, CA, USA; Sponsored by American Astronomical Society, USA

Contract(s)/Grant(s): RTOP 344-37-44-01; No Copyright; Avail: Issuing Activity; Abstract Only

Infrared spectroscopy of ices in interstellar dense molecular clouds has shown that they contain a variety of simple molecules, as well as aromatic hydrocarbons. While in these clouds, these ices are processed by ultraviolet light and cosmic rays. High vacuum, UV irradiation laboratory simulations conducted using various realistic approx. 10 K interstellar mixed-molecular ice analogs, both with and without polycyclic aromatic hydrocarbons (PAHs), have been carried out in NASA-Ames' Astrochemistry Laboratory. Upon warming, these irradiated ices are found to produce refractory organic residues. These residues have been analyzed using a variety of techniques, including HPLC and laser desorption mass spectrometry, and they have been shown to contain a variety of complex organic compounds. Several of these compounds may be of prebiotic significance. In particular, we will discuss the detection of quinones (substituted PAHs that are used by living systems for electron transport) and amphiphiles (molecules that self-assemble to form membranes). Laboratory simulations have also demonstrated that the organic products can show isotopic enrichments in D that provide clues for the mechanisms of their formation. Similar compounds and D enrichments are seen in the organics found in primitive meteorites, suggesting a direct link between interstellar chemistry and the delivery of organics to newly formed planets.
Author

Complex Compounds; Organic Chemistry; Organic Compounds; Interstellar Chemistry; Ice

20020027530 NASA Ames Research Center, Moffett Field, CA USA

Spectroscopy of Cosmic Carbon Analogs in Inert-Gas Matrices and in the Gas-Phase: Comparative Results and Perspectives for Astrophysics

Salama, Farid, NASA Ames Research Center, USA; [2001]; 1p; In English; EuroConference Matrix 2001, 7-13 Jul. 2001, Szklarska Poreba, Poland

Contract(s)/Grant(s): RTOP 344-01-57-41; No Copyright; Avail: Issuing Activity; Abstract Only

Recent studies of the spectroscopy of large (up to approx. 50 carbon atoms) neutral and Ionized polycyclic aromatic hydrocarbons (PAHs) and Fullerenes isolated in inert gas matrices will be presented. The advantages and the limitations of matrix isolation spectroscopy for the study of the molecular spectroscopy of interstellar dust analogs will be discussed. The laboratory data will be compared to the astronomical spectra (the interstellar extinction, the diffuse interstellar bands). Finally, the spectra of PAH ions isolated in neon/argon matrices will be compared to the spectra obtained for PAH ion seeded in a supersonic expansion. The astrophysical implications and future perspectives will be discussed.
Author

Spectroscopy; Astronomy; Cosmic Dust; Polycyclic Aromatic Hydrocarbons

20020027534 NASA Ames Research Center, Moffett Field, CA USA

Astronomical Problems and Laboratory Solutions

Allamandola, L. J.; [1995]; 1p; In English; Gordon Research Conference on the Chemistry and Physics of Matrix Isolated Species, 30 Jul. - 4 Aug. 1995, NH, USA; Sponsored by Gordon Research Conferences, Inc., USA

Contract(s)/Grant(s): RTOP 188-44-57; No Copyright; Avail: Issuing Activity; Abstract Only

Studying the chemical and isotopic composition of interstellar ice and dust provides insight into the composition and chemical history of the solid bodies in the solar nebula and the nature of the material subsequently brought into the inner part of the solar system by comets and meteorites. It is now possible to probe the composition of these microscopic interstellar particles (some hundreds of light years away), thanks to substantial progress in two areas: astronomical spectroscopic techniques in the middle-infrared, the spectral region most diagnostic of composition; and laboratory simulations which realistically reproduce the critical conditions in various interstellar environments. High quality infrared spectra of many different astronomical sources, some associated with dark molecular clouds, and others in the diffuse interstellar medium (DISM) are now available. What comparisons of these spectra with laboratory spectra tell us about the complex organic components of these materials is the subject of this talk. Most interstellar material is concentrated in large molecular clouds where simple molecules are formed by gas phase and dust grain surface reactions. Gaseous species (except H2) striking the cold (10K) dust will stick, forming an icy grain mantle. This accretion, coupled with energetic particle bombardment and UV photolysis, will produce a complex chemical mixture containing volatile, non-volatile, and isotopically fractionated species. One can compare spectra of the diffuse and dense interstellar medium with the

spectra of analogs produced in the laboratory under conditions which mimic those in these different environments. In this way one can determine the composition and abundances of the major constituents present and place general constraints on the types and relative abundances of organics coating the grains. Ices in dense clouds contain H2O, CH3OH, CO, perhaps some NH3 and H2CO, as well as nitriles and ketones or esters. there is some evidence that the later, more complex species, are also present on the grains in the DISM. The evidence for these materials, in addition to carbon rich materials such as amorphous carbon, microdiamonds, and polycyclic aromatic hydrocarbons will be reviewed and the possible connection with meteoritic organics will be discussed.
Author
Astronomy; Interstellar Matter; Energetic Particles; Chemical Composition; Infrared Radiation

20020027886 California Inst. of Tech., Downs Lab. of Physics, Pasadena, CA USA
The Puzzling Detection of D2CO in the Molecular Cloud L1689N
Ceccarelli, C., Observatoire de Bordeaux, France; Vastel, C., Centre d'Etudes et de Recherches, France; Tielens, A. G. G. M., Space Research Organization Netherlands, Netherlands; Castets, A., Observatoire de Bordeaux, France; Boogert, A. C. A., California Inst. of Tech., USA; Loinard, L., Universidad Nacional Autonoma de Mexico, Mexico; Caux, E., Centre d'Etudes et de Recherches, France; [2001]; 5p; In English
Contract(s)/Grant(s): NSF AST-99-80846; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
We present new observations of the D2CO emission towards the small cloud L1689N in the (rho) Ophiuchus complex. We surveyed five positions, three being a cut across a shock site and two probing the quiescent gas of the molecular cloud. We detected D2CO emission in the first three positions. The measured [D2CO]/[H2CO] is about 3%, whereas it is less than 2% in the quiescent gas. We discuss the implications of these new observations, which suggest that the bulk of the D2CO molecules is stored in grain mantles, and removed from the cold storage by the shock at the interface between the outflowing and quiescent gas. We review the predictions of the published models proposed to explain the observed high deuteration of formaldehyde. They fall in two basic schemes: gas phase and grain surface chemistry. None of the reviewed models is able to account for the observed [D2CO]/[H2CO] abundance ratio. A common characteristic shared by the models is apparently that all underestimate the atomic [D]/[H] ratio in the accreting gas.
Author
Molecular Clouds; Deuterium; Formaldehyde; Interstellar Matter; Interstellar Chemistry; Star Formation

20020029298 Smithsonian Astrophysical Observatory, Cambridge, MA USA
Infrared Extinction and the Initial Conditions for Star and Planet Formation ***Annual Report, 1 May 2001 - 30 Apr. 2002***
Lada, Charles J., Smithsonian Astrophysical Observatory, USA; February 2002; 1p; In English
Contract(s)/Grant(s): NAG5-9520; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
This grant funds a research program to use infrared extinction measurements to probe the detailed structure of dark molecular clouds and investigate the physical conditions which give rise to star and planet formation. The goals of the this program are to: (1) acquire deep infrared and molecular-line observations of a carefully selected sample of nearby dark clouds; (2) reduce and analyze the data obtained in order to produce detailed extinction maps of the clouds; and (3) prepare results, where appropriate, for publication.
Derived from text
Infrared Radiation; Molecular Clouds; Planetary Evolution; Stellar Evolution; Data Reduction

20020029300 Smithsonian Astrophysical Observatory, Cambridge, MA USA
XTE Observations of Intermediate Polars: RXTE TOO Observations of Supernovae ***Annual Report, 1 May 2001 - 30 Apr. 2002***
Schlegel, E., Smithsonian Astrophysical Observatory, USA; February 2002; 1p; In English
Contract(s)/Grant(s): NAG5-4413; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Two intermediate polar cataclysmic variables, PQ Gem and AO Psc, were observed jointly with the Rossi X-ray Timing Explorer (RXTE) and ground-based photometry. The analysis of intermediate polars (IPs) is complex because these objects exhibit light curves that behave differently as a function of energy and that behave differently when phased on the orbital or on the spin periods. The presence of two periods in one system is essentially equivalent to analyzing two different X-ray sources. A preliminary analysis of the PQ Gem data was carried out and presented at the Annapolis Workshop on Magnetic Cataclysmic Variables. The final analysis of the data were held up by problems with the background estimation. The RXTE PCA team has released a new version of the background estimator. The PQ Gem must be reanalyzed using the new background. We have also

installed a spectral model that calculates the expected emission from an accretion column. That model is undergoing final testing before we apply it to the data.
Derived from text
Cataclysmic Variables; Supernovae; X Ray Sources; Spectrum Analysis

20020029886 NASA Ames Research Center, Moffett Field, CA USA
Formation of Large Regular Satellites of Giant Planets in an Extended Gaseous Nebula: Subnebula Model and Accretion of Satellites
Mosqueira, I., NASA Ames Research Center, USA; Estrada, P. R., Cornell Univ., USA; [2000]; 30p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We model the subnebulae of Jupiter and Saturn wherein satellite accretion took place. We expect a giant planet subnebula to be composed of an optically thick (given gaseous opacity) inner region inside of the planet's centrifugal radius (located at r(sub c, sup J) = l5R(sub J) for Jupiter and r(sub c, sup S) = 22R(sub S) for Saturn), and an optically thin, extended outer disk out to a fraction of the planet's Roche lobe, which we choose to be R(sub roche)/5 (located at approximately 150R(sub J) near the inner irregular satellites for Jupiter, and approximately 200R(sub S) near Phoebe for Saturn). This places Titan and Ganymede in the inner disk, Callisto and Iapetus in the outer disk, and Hyperion in the transition region. The inner disk is the leftover of the gas accreted by the protoplanet. The outer disk results from the solar torque on nebula gas flowing into the protoplanet during the time of giant planet gap opening. For the sake of specificity, we use a cosmic mixture 'minimum mass' model to constrain the gas densities of the inner disks of Jupiter and Saturn (and also Uranus). For the total mass of the outer disk we use the simple scaling M(sub disk) = M(sub P)tau(sub gap)/tau(sub acc), where M(sub P) is the mass of the giant planet, tau(sub gap) is the gap opening timescale, and tau(sub acc) is the giant planet accretion time. This gives a total outer disk mass of approximately 100M(sub Callisto) for Jupiter and possibly approximately 200M(sub Iapetus) for Saturn (which contain enough condensables to form Callisto and Iapetus respectively). Our model has Ganymede at a subnebula temperature of approximately 250 K and Titan at approximately 100 K. The outer disks of Jupiter and Saturn have constant temperatures of 130 K and 90 K respectively.
Derived from text
Nebulae; Saturn Satellites; Protoplanets; Planetary Evolution; Mathematical Models; Accretion Disks; Galilean Satellites

20020029906 NASA Ames Research Center, Moffett Field, CA USA
Apse-Alignment of the Uranian Rings
Mosqueira, I., NASA Ames Research Center, USA; Estrada, P. R., Cornell Univ., USA; [2000]; 10p; In English
Contract(s)/Grant(s): NCC2-1170; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An explanation of the dynamical mechanism for apse-alignment of the eccentric Uranian rings is necessary before observations can be used to determine properties such as ring masses, particle sizes, and elasticities. The leading model relies on the ring self-gravity to accomplish this task, yet it yields equilibrium masses which are not in accord with Voyager radio measurements. We explore possible solutions such that the self-gravity and the collisional terms are both involved in the process of apse-alignment. We consider limits that correspond to a hot and a cold ring, and show that pressure terms may play a significant role in the equilibrium conditions for the narrow Uranian rings. In the cold ring case, where the scale height of the ring near periapse is comparable to the ring particle size, we introduce a new pressure correction pertaining to a region of the ring where the particles are locked in their relative positions and jammed against their neighbors, and the velocity dispersion is so low that the collisions are nearly elastic. In this case, we find a solution such that the ring self-gravity maintains apse-alignment against both differential precession (m = 1 mode) and the fluid pressure. We apply this model to the Uranian alpha ring, and show that, compared to the previous self-gravity model, the mass estimate for this ring increases by an order of magnitude. In the case of a hot ring, where the scale height can reach a value as much as fifty times larger than a particle size, we find velocity dispersion profiles that result in pressure forces which act in such a way as to alter the ring equilibrium conditions, again leading to a ring mass increase of an order of magnitude; however, such a velocity dispersion profile would require a different mechanism than is currently envisioned for establishing heating/cooling balance in a finite-sized, inelastic particle ring. Finally, we introduce an important correction to the model of Chiang and Goldreich.
Derived from text
Alignment; Planetary Gravitation; Uranus Rings; Velocity Distribution; Computerized Simulation

20020029907 NASA Ames Research Center, Moffett Field, CA USA

Formation of Large Regular Satellites of Giant Planets in an Extended Gaseous Nebula, 2, Satellite Migration and Survival

Mosqueira, I., NASA Ames Research Center, USA; Estrada, P. R., Cornell Univ., USA; [2000]; 20p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Using an optically thick inner disk and an extended, optically thin outer disk as described in Mosqueira and Estrada, we compute the torque as a function of position in the subnebula, and show that although the torque exerted on the satellite is generally negative, which leads to inward migration as expected, there are regions of the disk where the torque is positive. For our model these regions of positive torque correspond roughly to the locations of Callisto and Iapetus. Though the outer location of zero torque depends on the (unknown) size of the transition region between the inner and outer disks, the result that Saturn's is found much farther out (at approximately 3r(sub c, sup S) where r(sub c, sup S) is Saturn's centrifugal radius) than Jupiter's (at approximately 2r(sub c, sup J), where r(sub c, sup J) is Jupiter's centrifugal radius) is mostly due to Saturn's less massive outer disk, and larger Hill radius. For a satellite to survive in the disk the timescale of satellite migration must be longer than the timescale for gas dissipation. For large satellites (approximately 1000 km) migration is dominated by the gas torque. We consider the possibility that the feedback reaction of the gas disk caused by the redistribution of gas surface density around satellites with masses larger than the inertial mass causes a large drop in the drift velocity of such objects, thus improving the likelihood that they will be left stranded following gas dissipation. We adapt the inviscid inertial mass criterion to include gas drag, and m-dependent non-local deposition of angular momentum.

Derived from text

Migration; Torque; Saturn Satellites; Position (Location); Uranus Satellites

20020030303 Sydney Univ., School of Physics, Australia

Stochastic Growth Theory of Spatially-Averaged Distributions of Langmuir Fields in Earth's Foreshock

Boshuizen, Christopher R., Sydney Univ., Australia; Cairns, Iver H., Sydney Univ., Australia; Robinson, P. A., Sydney Univ., Australia; Geophysical Research Letters; Sep. 15, 2001; ISSN 0094-8276; Volume 28, No. 18, pp. 3569-3572; In English

Contract(s)/Grant(s): NAG5-6369

Report No.(s): Paper-2000GL012709; Copyright; Avail: Issuing Activity

Langmuir-like waves in the foreshock of Earth are characteristically bursty and irregular, and are the subject of a number of recent studies. Averaged over the foreshock, it is observed that the probability distribution is power-law P(bar)(log E) in the wave field E with the bar denoting this averaging over position, In this paper it is shown that stochastic growth theory (SGT) can explain a power-law spatially-averaged distributions P(bar)(log E), when the observed power-law variations of the mean and standard deviation of log E with position are combined with the log normal statistics predicted by SGT at each location.

Author

Stochastic Processes; Earth Movements; Electrostatic Waves

20020030361 Sydney Univ., School of Physics, Australia

Role of Collective Effects in Dominance of Scattering Off Thermal Ions Over Langmuir Wave Decay: Analysis, Simulations, and Space Applications

Cairns, Iver H., Sydney Univ., Australia; Physics of Plasmas; December 2000; ISSN 1070-664X; Volume 7, No. 12, pp. 4901-4915; In English

Contract(s)/Grant(s): NAGW-2040; NAG5-6127; NAG5-6369; Copyright; Avail: Issuing Activity

Langmuir waves driven to high levels by beam instabilities are subject to nonlinear processes, including the closely related processes of scattering off thermal ions (STI) and a decay process in which the ion response is organized into a product ion acoustic wave. Calculations of the nonlinear growth rates predict that the decay process should always dominate STI, creating two paradoxes. The first is that three independent computer simulation studies show STI proceeding, with no evidence for the decay at all. The second is that observations in space of type 3 solar radio bursts and Earth's foreshock, which the simulations were intended to model, show evidence for the decay proceeding but no evidence for STI. Resolutions to these paradoxes follow from the realization that a nonlinear process cannot proceed when its growth rate exceeds the minimum frequency of the participating waves, since the required collective response cannot be maintained and the waves cannot respond appropriately, and that a significant number of e-foldings and wave periods must be contained in the time available. It is shown that application of these 'collective' and 'time scale' constraints to the simulations explains why the decay does not proceed in them, as well as why STI proceeds in specific simulations. This appears to be the first demonstration that collective constraints are important in understanding nonlinear phenomena. Furthermore, applying these constraints to space observations, it is predicted that the decay should proceed (and dominate STI) in type 3 sources and the high beam speed regions of Earth's foreshock for a specific range

of wave levels, with a possible role for STI alone at slightly higher wave levels. Deeper in the foreshock, for slower beams and weaker wave levels, the decay and STI are predicted to become ineffective. Suggestions are given for future testing of the collective constraint and an explanation for why waves in space are usually much weaker than in the simulations.
Author
Computerized Simulation; Wave Dispersion; Ion Scattering; Paradoxes

20020031926 National Center for Atmospheric Research, Boulder, CO USA
Heioseismic Analysis of the Solar Activity Cycle
Reyes, S. J.; Nov. 22, 2001; 214p; In English
Report No.(s): PB2002-102514; NCAR/CR-173; No Copyright; Avail: National Technical Information Service (NTIS)
Solar oscillations, in particular their characteristic frequencies, provide a unique diagnostic tool to investigate and understand the structure and dynamics of the Sun. These frequencies are modified in well known manners by different internal dynamical effects, like rotation or magnetism, allowing the study of the underlying physical processes. Improved data from different operational projects such as BiSON, IRIS, GONG, LOWL, etc has enhanced in the last few years our ability to study the solar interior. The LOWL experiment has been collecting solar observation data since February 1994 and represents one of the best Doppler analyzers for the observation of the solar oscillations. It is based on a Magneto-Optical Filter with no moving parts, which employs a two-beam technique to make simultaneous observations of the solar disk in opposite wings of the absorption line of Potassium at 769.9 nm.
NTIS
Activity Cycles (Biology); Solar Oscillations; Solar Activity; Sun

20020032629 Smithsonian Astrophysical Observatory, Cambridge, MA USA
The Star Formation History of Orion and its Environs ***Annual Report, 15 Mar. 2001 - 15 Feb. 2002***
Calvet, Nuria, Smithsonian Astrophysical Observatory, USA; January 2002; 3p; In English
Contract(s)/Grant(s): NAG5-10545; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
During the Winter and Fall 2001 observing campaigns, we obtained multifilter photometry using the Quest camera on the 1mt Schmidt of the Venezuelan National Observatory, to continue the survey of the Orion clouds. In the Winter 2001 season, we obtained photometry for 9 scans at DEC=+5, 3 scans at DEC=-5, and 2 scans at DEC=-3, while 2 additional scans at DEC=-3 were obtained during the Fall 2001 observing campaign (the width of each scan is 2.3 arc minutes). The photometric survey has not been completed this season because the instrument was damaged by lightening on Sep 2001 and operations were suspended until Dec 2001. Observations are still under way. Nonetheless, we have enough scans at -3 and +5 to start selecting candidates for spectroscopic follow up on the next season. Spectra of more than 300 objects was obtained with the FAST spectrograph on the Mt Hopkins 48 inch telescope during observing campaigns Jan-March 2001, and Oct-Dec 2001. Bad weather prevented observations with Hydra on the WIYN telescope on KPNO in Jan 2001. The FAST spectra are been analyzed to select the young population of the regions. Observations in the JHKL bands were obtained for a sample of 20-30 objects in Ori Ia and Ib from scan centered at DEC=-l, with the StellIRCam on the Mt Hopkins 48 inch telescope on Nov 2001. L band observations will be effective for picking up objects surrounded by accretion disks, in which inner disk holes prevent having any excess at shorter wavelength bands. Observations at 10 micrometers and 18 micrometers were obtained in que mode for a sample of 20 objects in Ori Ia and Ib in the same regions as the near IR photometry with the Gemini-South telescope. These new data is presently been reduced and analyzed, together with data from the observing campaigns of 2000. Analysis of Hydra fields at strips centered at DEC=-1 and +1 have confirmed 105 more candidates as low mass pre-main sequence objects. In addition, every target was detected at 10 micrometers and a few at 18 micrometers. With these data, combined with our optical and JHKL photometry, we will construct spectral energy distributions. This will allow us to begin studying the structure of disks around low mass T Tauri stars in the distributed population of the Orion clouds, for direct comparison with that of Taurus. Ours is the first determination of the infrared emission of protoplanetary disks around low mass stars in the Orion region.
Derived from text
Star Formation; Orion Nebula; Astronomical Photometry; Spectrographs

20020032692 NASA Ames Research Center, Moffett Field, CA USA
Constraints on the Organic Composition of Meteoroids
McKay, Chris P., NASA Ames Research Center, USA; Steel, D. I., Adelaide Univ., Australia; [1996]; 1p; In English; ASM Colloquium 10, 8-12 Jul. 1996, Versailles, France; Sponsored by American Society for Metals, USA
Contract(s)/Grant(s): RTOP 185-52-82-04; No Copyright; Avail: Issuing Activity; Abstract Only

One of the major results obtained from the spacecraft experiments at Comet Halley, and subsequent telescopic observations of comets, is the identification of a substantial organic fraction of cometary dust. There are also various meteor observations which indicate that there may also be a significant heavy organic component of small (mm-cm) meteoroids entering the terrestrial atmosphere. Here we describe the results of thermodynamic modelling of idealized meteoroids which was directed towards discovering which volatile species could survive for the (typically) millennia between release from a comet and entry into the atmosphere. We find that the most likely species to survive from plausible volatile constituents axe organic species with carbon numbers greater than -20 (i.e., tarry or kerogen-type chemicals). This result is in accord with recent observations of the heights of ablation of meteors observed using radar techniques, and provides supportive evidence for the idea that organic molecules are continually raining down upon our planet.
Author
Meteoroids; Chemical Composition; Planetary Atmospheres

20020033014 NASA Ames Research Center, Moffett Field, CA USA
Interstellar Grain Surface Chemistry
Tielens, Alexander G. G. M., NASA Ames Research Center, USA; [1995]; 1p; In English; Workshop on Protostellar Chemistry, 27-31 Mar. 1995, Leiden, Netherlands
Contract(s)/Grant(s): RTOP 399-20-10; No Copyright; Avail: Issuing Activity; Abstract Only

Chemistry on grain surfaces plays an Important role in the formation of interstellar Ices, It can also influence the composition of the gas phase through outgassing near luminous, newly formed stars. This paper reviews the chemical processes taking place on Interstellar grain surfaces with the emphasis on those transforming CO into other hydrocarbons. At low, molecular cloud temperatures (approximately equal to 10K), physisorption processes dominate interstellar grain surface chemistry and GO is largely hydrogenated through reactions with atomic H and oxidized through reactions with atomic O. The former will lead to the formation of H2CO and CH3OH ices, while the latter results in CO2 ice. The observational evidence for these ices in molecular clouds will be discussed. Very close to protostars, the gas and grain temperatures are much higher (approximately equal to 500K) and chemisorption processes, including catalytic surface reactions, becomes important. This will be illustrated based upon our studies of the Fischer-Tropsch Synthesis of CH4 from CO on metallic surfaces. Likely, this process has played an important role in the early solar nebula. Observational consequences will be pointed out.
Author
Interstellar Chemistry; Surface Reactions; Synthesis (Chemistry); Granular Materials

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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.

20020028366 NASA Ames Research Center, Moffett Field, CA USA
Exopaleontology at The Pathfinder Landing Site
Farmer, Jack D., NASA Ames Research Center, USA; DesMarais, David J., NASA Ames Research Center, USA; Greeley, Ronald, Arizona State Univ., USA; [1995]; 2p; In English; Lunar and Planetary Science Conference, 13-17 Mar. 1995, Houston, TX, USA
Contract(s)/Grant(s): RTOP 185-52-82; No Copyright; Avail: Issuing Activity; Abstract Only

The Mars Pathfinder Mission is a Discovery Class mission that will place a small lander and rover on the surface of Mars in July of 1997. It is primarily a technology demonstration to test the feasibility of a direct entry-delivery system, but carries a nominal scientific payload that includes rover-lander and instrumentation for limited mineralogical analysis. The nominal landing site was selected by the Pathfinder Team under the leadership of Dr. Matthew Golombek (JPL) based input from 60 participants at a Landing Site Workshop held last Spring at the Lunar Planetary Institute in Houston. The mission constraints for the landing site were 0-30 deg. N latitude, and below the 0.0 elevation datum. Over 20 landing sites were proposed and a nominal site was selected on southern Chryse Planitia near the terminae of the Ares and Tui outflow channels. In part, the decision to land at this location was based on the opportunity to sample a potentially large number lithologies in a small area (the rover will have a range of a few tens of meters from the lander). The purpose here is to review the general geological context of the landing site and the rationale for Exobiology's recommendation of the Ares site given at the workshop last spring. Because Ares and Tui Valles are sourced within terranes that may have originated by thermokarst processes, hydrothermal processes could have operated there for some time. Hydrothermal systems are presently regarded as important sites for a fossil record on Mars. Models for the

formation of the outflow channels suggest that thermal spring sinters and associated aqueous mineral deposits, high priority targets for Mars Exopaleontology, could have formed in association with thermokarst processes and subsequently been delivered to the landing site in large quantities during the periodic cataclysmic outflows that created the channels.
Author
Exobiology; Paleontology; Mars Pathfinder; Mars Landing Sites

20020028400 NASA Ames Research Center, Moffett Field, CA USA
Mars Exobiology: The Principles Behind The Plan For Exploration
DesMarais, D. J., NASA Ames Research Center, USA; DeVincenzi, Donald L., NASA Ames Research Center, USA; Carr, M. H., Geological Survey, USA; Clark, B. C., Martin Marietta Corp., USA; Farmer, J. D., NASA Ames Research Center, USA; Hayes, J. M., Indiana Univ., USA; Holland, H., Harvard Univ., USA; Kerridge, J. F., NASA, USA; Klein, H. P., Santa Clara Univ., USA; McDonald, G. D., Cornell Univ., USA; [1995]; 1p; In English; Lunar and Planetary Science Conference, 13-17 Mar. 1995, Houston, TX, USA
Contract(s)/Grant(s): RTOP 152-52-32; No Copyright; Avail: Issuing Activity; Abstract Only

The search for evidence of life on Mars is a highly interdisciplinary enterprise which extends beyond the traditional life sciences. Mars conceivably had a pervasive ancient biosphere which may have persisted even to the present, but only in subsurface environments. Understanding the history of Mars' global environment, including its inventory of volatile elements, is a crucial part of the search strategy. Those deposits (minerals, sediments, etc.) which could have and retained a record of earlier biological activity must be identified and examined. While the importance of. seeking another biosphere has not diminished during the years since the Viking mission, the strategy for Mars exploration certainly has been modified by later discoveries. The Viking mission itself demonstrated that the present day surface environment of Mars is hostile to life as we know it. Thus, to search effectively for life on Mars, be it extant or extinct, we now must greatly improve our understanding of Mars the planet. Such an understanding will help us broaden our search beyond the Viking lander sites, both back in time to earlier epochs and elsewhere to other sites and beneath the surface. Exobiology involves much more than simply a search for extant life beyond Earth. It addresses the prospect of long-extinct biospheres and also the chemistry, organic and otherwise, which either led to life or which occurred on rocky planets that remained lifeless. Even a Mars without a biosphere would reveal much about life. How better to understand the origin and impact of a biosphere than to compare Earth with another similar but lifeless planet? Still, several relatively recent discoveries offer encouragement that a Martian biosphere indeed might have existed. The ancient Martian surface was extensively sculptured by volcanism and the activity of liquid water. Such observations invoke impressions of an ancient martian atmosphere and environment that resembled ancient Earth more than present-day Mars. Since Viking, we have learned that our own biosphere began prior to 3.5 billion years ago, during an early period when our solar system apparently was sustaining clement conditions on at least two of its planets. Also, we have found that microorganisms can survive, even flourish, in environments more extreme in temperature and water availability than had been previously recognized. The common ancestor of life on Earth probably was adapted to elevated temperatures, raising the possibility that hydrothermal systems played a central role in sustaining our early biosphere. If a biosphere ever arose on Mars, at least some of its constituents probably dwelled in the subsurface. Even today, conditions on Mars and Earth become more similar with increasing depth beneath their surfaces. For example, under the martian permafrost, the geothermal gradient very likely maintains liquid water in environments which resemble aquifers on Earth. Indigenous bacteria have recently been recovered from deep aquifers on Earth. Liquid groundwater very likely persisted throughout Mars' history. Thus, martian biota, if they ever existed, indeed might have survived in subsurface environments.
Author
Exobiology; Mars Exploration; Mars Environment; Extraterrestrial Life

20020028891 NASA Goddard Space Flight Center, Greenbelt, MD USA
Escape of H and D from Mars' Atmosphere and the Evolution of its Crustal Water Reservoirs
Hartle, Richard E., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; 2001 Fall AGU Meeting, 10-14 Dec. 2001, San Francisco, CA, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The evolution of water on Mars involves preferential escape of hydrogen over deuterium, producing its deuterium rich atmosphere with a D/H ratio 5.2 times that of terrestrial water. In the past decade, several estimates have been made of the magnitudes of current and ancient crustal water reservoirs on Mars that freely exchange with its atmosphere. Some of the differences in the magnitudes of the reservoirs are influenced by differences in the following basic parameters: composition of H, D, H2 and HD at the exobase; thermal history of the atmosphere; escape mechanisms; and the D/H ratio of earlier epochs as inferred from meteorites. The dominant escape mechanism used in the estimates is Jeans escape. However, the Jeans escape flux is enhanced considerably when atmospheric winds and rotation are applied at the exobase . This constraint is of particular

importance because the enhancement of the D escape flux can be an order of magnitude greater than the enhancement of the H escape flux. This preferential enhancement of the D escape flux over that of H means that a great deal more H must escape (than in the case without winds and rotation) to attain the same D/H ratio in the today's atmosphere. Another new constraint on reservoir magnitudes comes from the recent interpretation of Martian meteorite data, which suggests that the D/H ratio was 2 times that of terrestrial water at the end of the heavy bombardment period (1). These two constraints together lead to larger current and ancient crustal water reservoirs. Applying Rayleigh fractionation, new estimates of the sizes of the water reservoirs are made using the above constraints along with plausible values for hydrogen and deuterium densities, temperatures, wind speeds and rotation rates at the exobase.
Author
Deuterium; Hydrogen; Mars Atmosphere; Planetary Crusts; Reservoirs

20020029924 Los Alamos National Lab., NM USA
Distribution of iron and titanium on the lunar surface from lunar prospector gamma ray spectra
Prettyman, T.; Jan. 01, 2001; 3p; In English
Report No.(s): DE2001-774348; LA-UR-01-536; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Gamma ray pulse height spectra acquired by the Lunar Prospector (LP) Gamma-Ray Spectrometer (GRS) contain information on the abundance of major elements in the lunar surface, including O, Si, Ti, Al, Fe, Mg, Ca, K, and Th. With the exception of Th and K, prompt gamma rays produced by cosmic ray interactions with surface materials are used to determine elemental abundance. Most of these gamma rays are produced by inelastic scattering of fast neutrons and by neutrons and by neutron capture. The production of neutron-induced gamma rays reaches a maximum deep below the surface (e.g. approximately 140g/cm2 for inelastic scattering and approximately 50 g/cm2 for capture). Consequently, gamma rays sense the bulk composition of lunar materials, in contrast to optical methods (e.g. Clementine Spectral Reflectance (CSR)), which only sample the top few microns. Because most of the gamma rays are produced deep beneath the surface, few escape unscattered and the continuum of scattered gamma rays dominates the spectrum. In addition, due to the resolution of the spectrometer, there are few well-isolated peaks and peak fitting algorithms must be used to deconvolve the spectrum on order to determine the contribution of individual elements.
NTIS
Lunar Topography; Lunar Surface; Gamma Ray Spectra; Iron; Titanium; Inelastic Scattering

20020030022 California Inst. of Tech., Div. of Geological and Planetary Sciences, Pasadena, CA USA
Long Term Monitoring of the Io Plasma Torus During the Galileo Encounter ***Final Report, 1 Jun. 1999 - 30 Nov. 2000***
Brown, Michael E., California Inst. of Tech., USA; [2002]; 5p; In English
Contract(s)/Grant(s): NAG5-8462; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
In the fall of 1999, the Galileo spacecraft made four passes into the Io plasma torus, obtaining the best in situ measurements ever of the particle and field environment in this densest region of the Jovian magnetosphere. Supporting observations from the ground are vital for understanding the global and temporal context of the in situ observations. We conducted a three-month-long Io plasma torus monitoring campaign centered on the time of the Galileo plasma torus passes to support this aspect of the Galileo mission. The almost-daily plasma density and temperature measurements obtained from our campaign allow the much more sparse but also much more detailed Galileo data to be used to address the issues of the structure of the Io plasma torus, the stability mechanism of the Jovian magnetosphere, the transport of material from the source region near Io, and the nature and source of persistent longitudinal variations. Combining the ground-based monitoring data with the detailed in situ data offers the only possibility for answering some of the most fundamental questions about the nature of the Io plasma torus.
Author
In Situ Measurement; Io; Planetary Magnetic Fields; Plasma Density; Toroidal Plasmas; Temperature Measurement

20020030300 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA
Effectiveness of Near-Grazing Incidence Reflection in Creating the Rotationally Modulated Lanes in the Jovian Hectometric Radio Emission Spectrum
Menietti, J. D., Iowa Univ., USA; Gurnett, D. A., Iowa Univ., USA; Kurth, W. S., Iowa Univ., USA; Groene, J. B., Iowa Univ., USA; Radio Science; July - August 1999; ISSN 0048-6604; Volume 34, No. 4, pp. 1005-1012; In English
Contract(s)/Grant(s): JPL-958779
Report No.(s): Paper-1999RS900036; Copyright; Avail: Issuing Activity
The Galileo plasma wave instrument has identified a narrow (in frequency) attenuation band in the hectometric emission that varies in frequency with system 3 longitude. It is possible to model this emission band assuming a high-latitude cyclotron source

region with emission that is efficiently attenuated when the ray path is nearly tangent to an L shell that is close to the Io flux tube. The data suggest that the mechanism for attenuating the emission is very efficient, with the ratio of attenuated to unattenuated emission I/I(sub o) is less than 0.02, and not a strong function of frequency. In this paper we demonstrate that incoherent scattering alone cannot explain the attenuation lane, which does not preclude coherent scattering by uncertain processes. We find rather that the source of attenuation is consistent with near-grazing incidence reflection of emission from an L shell that is near the Io flux tube (a caustic surface).
Author
Attenuation; Emission Spectra; Incoherent Scattering; Io; Radio Emission

20020032307 NASA Ames Research Center, Moffett Field, CA USA
Detection of Gaseous Methane on Pluto
Young, Leslie, NASA Ames Research Center, USA; Tokunaga, Alan, Hawaii Univ., USA; Elliot, J., Massachusetts Inst. of Tech., USA; deBergh, Catherine, Observatoire de Paris-Meudon, France; Owen, Tobias, Hawaii Univ., USA; [1995]; 1p; In English
Contract(s)/Grant(s): RTOP 196-41-57; No Copyright; Avail: Issuing Activity; Abstract Only

We obtained Pluto's spectrum using the CSHELL echelle spectrograph at NASA's IRTF on Mauna Kea, on 25-26 May 1992, with a spectral resolution of 13,300. The spectral range (5998 - 6018 per centimeter, or 1661.8 - 1666.9 nm) includes the R(0) and the Q(1) - Q(9) lines of the 2v3 band of methane. The resulting spectrum shows the first detection of gaseous methane on Pluto, with a column height of 1.20 (sup +3.15) (sub -0.87) cm-A (3.22 (sup +8.46) (sub -2.34) x 10(exp 19) molecule per square centimeter)).
Author
Methane; Detection; Pluto (Planet)

20020033015 NASA Ames Research Center, Moffett Field, CA USA
Simulated Craters on Venus
Zahnle, Kevin, NASA Ames Research Center, USA; [1995]; 1p; In English; 26th Lunar and Planetary Science Conference, 11-19 Mar. 1995, Houston, TX, USA
Contract(s)/Grant(s): RTOP 185-52-22-08; No Copyright; Avail: Issuing Activity; Abstract Only

The thick atmosphere of Venus prevents all but the largest impactors from cratering the surface. The number of small craters on Venus provides an interesting, and statistically significant test of models for the disruption and deceleration of impacting bodies. Here we compare Monte Carlo simulated crater distributions to the observed crater distribution on Venus. The simulation assumes: (1) a power law mass distribution for impactors of the form N(sub cum) alpha m (exp-b) where b=0.8; (2) isotropic incidence angles; (3) velocity at the top of the atmosphere of 20 kilometers per second (more realistic velocity distributions are also considered); (4) Schmidt-Housen crater scaling, modified such that only the normal component of the impact velocity contributes to cratering, and using crater slumping as parameterized (5) and modern populations (60% carbonaceous, 40% stone, 3% iron) and fluxes of asteroids. We use our previously developed model for the disruption and deceleration of large bodies striking thick planetary atmospheres to calculate the impact velocity at the surface as a function of impactor mass, incident velocity, and incident angle. We use a drag coefficient c(sub d) =1; other parameters are as described in Chyba et al. We set a low velocity cutoff of 500 meters per second on crater-forming impacts. Venus's craters are nicely matched by the simulated craters produced by 700 million years of striking asteroids. Shown for comparison are the simulated craters produced by incident comets over the same period, where for comets we have assumed b=0.7 and a flux at 10(exp 14) g 30% that of asteroids. Systematic uncertainties in crater scaling and crater slumping may make the surface age uncertain by a factor of two.
Author
Craters; Venus (Planet); Venus Atmosphere; Simulation

92
SOLAR PHYSICS

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

20020027532 NASA Ames Research Center, Moffett Field, CA USA
Dissipation of the Solar Nebula
Cassen, Patrick; [1995]; 1p; In English; 1995 Gordon Research Conference, 17-20 Jun. 1995, New Hampton, NH, USA; Sponsored by Gordon Research Conferences, Inc., USA
Contract(s)/Grant(s): RTOP 452-22-94-01; No Copyright; Avail: Issuing Activity; Abstract Only

We review the evidence that the lifetimes of circumstellar disks, and the solar nebula in particular, are of the order 107 years. Mechanisms of evolution and removal are examined and compared with observational evidence. The expected consequences for solar system material of different removal mechanisms are discussed, and promising avenues for future research are identified. Author

Dissipation; Solar Nebula

20020027998 National Center for Atmospheric Research, Boulder, CO USA

Coronal Magnetometry: A Feasibility Study

Judge, P. G.; Casini, R.; Tomczyk, S.; Edwards, D. P.; Francis, E.; Jan. 2001; 84p; In English

Report No.(s): PB2002-102493; NCAR/TN-466-STR; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Measurements of components of the vector magnetic field in the solar corona can potentially yield information critical to our understanding of coronal structure, dynamics and heating. In this report we re-examine various techniques for such measurements, in particular those that can be applied outside of active regions, to investigate issues critical to the development of a new 'coronal magnetometer,' and to lay down some foundations upon which a suitable instrument may be developed for synoptic observations. The well-known forbidden coronal emission lines of magnetic dipole (M1) character appear to have the highest potential to address outstanding problems in coronal physics, especially those related to the storage and release of magnetic free energy. Measurements of the full Stokes vector of M1 lines can constrain both the line-of-sight (LOS) field strength, through the longitudinal Zeeman effect seen in Stokes V profiles, and the direction of the vector field projected onto the plane-of-the-sky (POS), through the analysis of resonance scattering-induced linear polarization seen in Stokes Q and U, in the so-called 'strong field' regime of the Hanl effect.

NTIS

Solar Corona; Solar Magnetic Field; Field Strength; Linear Polarization; Emission Spectra; Resonance Scattering

93
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.

20020029850 Los Alamos National Lab., NM USA

Predicting the production rates of cosmogenic nuclides

Reedy, R. C.; Nov. 01, 1999; 6p; In English

Report No.(s): DE2001-787316; LA-UR-99-5872; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The determination and some uses of production rates of cosmogenic nuclides are reviewed. Emphasis is on work done since 1993 for long-lived cosmogenic radionuclides in extraterrestrial matter. Several Monte Carlo computer codes are being used to numerically simulate the interactions and transport of cosmic-ray particles. Thin- and thick-target irradiations have been done with protons to determine reaction cross sections and to experimentally simulate cosmic-ray bombardments. Cross sections for some neutron-induced reactions are being measured or inferred from thick-target irradiations. Some other work involving cosmogenic-nuclide production rates are discussed.

NTIS

Predictions; Extraterrestrial Matter; Radioactive Isotopes; Nuclides; Cosmology

20020030301 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA

Local Time Dependence of Jovian Radio Emissions Observed by Galileo

Menietti, J. D., Iowa Univ., USA; Gurnett, D. A., Iowa Univ., USA; Kurth, W. S., Iowa Univ., USA; Groene, J. B., Iowa Univ., USA; Geophysical Research Letters; Mar. 01, 1999; ISSN 0094-8276; Volume 26, No. 5, pp. 569-572; In English

Contract(s)/Grant(s): JPL-958779

Report No.(s): Paper-1999GL900047; Copyright; Avail: Issuing Activity

Galileo has been in orbit around Jupiter since December 1995. All the orbits are equatorial and elliptical, with apogees between 60 R(sub J) - 142 R(sub J) and perigees from 8 - 12 R(sub J). Since orbit injection, the plasma wave instrument (PWS) has been collecting data over specific intervals of each of the orbits at all local times and a range of different radial distances. We present the results of a survey of the data for the frequency range 300 kHz to 5.6 MHz, which includes the hectometric (HOM) and low-frequency decametric (DAM) emissions. The results indicate that both the HOM and DAM emission are more intense and occur more frequently in the midnight sector of Jupiter. This is in analogy to Earth and consistent with a magnetic substorm

source for a portion of the radio emissions in this frequency range. Another peak in the power levels is observed on the Jovian dayside in the local time range 11 hrs is less than LT is less than 12 hrs. This peak does not have a terrestrial counterpart. We speculate that this dayside peak may be a result of sampling near perigee, but we cannot rule out the possibility that this is not the case.
Author
Time Dependence; Radio Emission; Jupiter (Planet); Radio Astronomy; Plasma Waves

20020030302 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA
A High-Resolution Study of Quasiperiodic Radio Emissions Observed by the Galileo Plasma Wave Instrument
Menietti, J. D., Iowa Univ., USA; Christopher, I., Iowa Univ., USA; Granroth, L. J., Iowa Univ., USA; Radio Science; July/August 2001; ISSN 0048-6604; Volume 36, No. 4, pp. 815-824; In English
Contract(s)/Grant(s): NAG5-8918
Report No.(s): Paper-2000RS002570; Copyright; Avail: Issuing Activity

We have conducted a study of quasiperiodic emission observed by the plasma wave instrument on board the Galileo spacecraft. These emissions appear as broadband bursts with dominant periods ranging from 10 min to over 40 min. For these emissions we have explicitly analyzed the high-resolution (waveform) data to determine the presence of impulsive, solitary signatures. Our investigations have indicated that the broadband bursts, as well as the background more narrowband continuum emission, are composed of a highly turbulent spectrum. Within the broadband burst, however, there are higher-frequency components present, but no impulsive electrostatic signatures. Also significantly, the broadband bursts show no low-frequency dispersion. We conclude that the bursts are consistent with a distant, electromagnetic source, probably in the near-Jupiter vicinity.
Author
Waveforms; Broadband; Radio Bursts

20020030356 Los Alamos National Lab., NM USA
Neutrino clustering and the z-burst model
McKellar, B.; Barbutt, M.; Jun. 01, 2001; 14p; In English
Report No.(s): DE2001-783262; LA-UR-01-3234; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The possibility that the observed Ultra High Energy Cosmic Rays are generated by high energy neutrinos creating 'Z-bursts' in resonant interactions with the background neutrinos has been proposed, but there are difficulties in generating enough events with reasonable incident neutrino fluxes. We point out that this difficulty is overcome of the background neutrinos have coalesced into 'neutrino clouds' - a possibility previously suggested by some of us in another context. The limitations that this mechanism for the generation of UHECRs places on the high energy neutrino flux, on the masses of the background neutrinos and the characteristics of the neutrino clouds are spelled out.
NTIS
Cosmic Rays; Energy Spectra; Neutrinos

99
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.

20020032691 NASA Johnson Space Center, Houston, TX USA
Shuttle-Mir: The USA and Russia Share History's Highest Stage
Morgan, Clay, NASA Johnson Space Center, USA; 2001; 220p; In English; Original contains color illustrations; See also NASA/SP-2001-4603 which is a companion CD-ROM
Report No.(s): NASA/SP-2001-4225; NAS 1.21:4225; LC-2001-026605; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This book is an example of what may become the norm for history texts-an illustrated narrative accompanied by a CD-ROM. The text tells the story from the human side. It is based on reflections and quotes from the astronauts, cosmonauts, and team members who participated in the historic partnership. The main chapters give the perspectives of the seven U.S. astronauts living on Mir. The "STS boxes" share the Space Shuttle crews' experiences from the 11 Shuttle-Mir missions. The "Meanwhile on Earth" sections provide details of what was happening on Earth while the attention of the Program focused on the situations in space.

The text reflects conventional usage; that is, temperature is given in degrees Fahrenheit, and metrics are used as appropriate. While this publication provides an accurate overview of the Shuttle-Mir Program, the reader is encouraged to explore the companion CD-ROM. It contains a complete, searchable text of the book itself plus source publications, mission data, status reports, drawings and illustrations, videos and hundreds of images, and even a virtual Shuttle-Mir children's book. of particular interest are the Shuttle-Mir oral history transcripts and the letters written by American astronauts while they were in residence on the Russian space station. Many of the quotes in "Shuttle-Mir: The U.S. and Russia Share History's Highest Stage" came from sources located on the CD-ROM. The reader is invited to explore the Shuttle-Mir story through the words, images, and insights of those who took part in it.

Author

Mir Space Station; Astronauts; Cosmonauts; Space Shuttle Missions; Spacecrews

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