Scientific and Technical Aerospace Reports

Volume 40
October 18, 2002

National Aeronautics and Space Administration
Langley Research Center

Scientific and Technical Information Program Office

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

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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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Subject Categories of the Division A. Aeronautics

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 1

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 6

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 9

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 11

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 15

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 15

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 18

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) 20

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

12 Astronautics (General) 22

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 23

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

14 Ground Support Systems and Facilities (Space) 23

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also *09 Research and Support Facilities (Air).*

15 Launch Vehicles and Launch Operations 24

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 25

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 26

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 27

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

19 Spacecraft Instrumentation and Astrionics 27

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

20 Spacecraft Propulsion and Power 28

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

23 Chemistry and Materials (General) 32

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 34

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

25 Inorganic, Organic, and Physical Chemistry 36

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 49

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

27 Nonmetallic Materials 54

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 61

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*.

Subject Categories of the Division D. Engineering

31 Engineering (General) 70

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 75

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 88

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related infor-

mation 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 94

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 103

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 108

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 110

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 112

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

42 Geosciences (General) 118

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 125

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 127

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 130

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

46 Geophysics 141

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 144

Includes weather observation forecasting and modification.

48 Oceanography 149

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

51 Life Sciences (General) 151

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 174

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 176

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

54 Man/System Technology and Life Support 178

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*..

Subject Categories of the Division G. Mathematical and Computer Sciences

59 Mathematical and Computer Sciences (General) 181

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 182

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 183

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 195

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 199

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 200

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

65 Statistics and Probability 202

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

66 Systems Analysis and Operations Research 203

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

67 Theoretical Mathematics 205

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

Subject Categories of the Division H. Physics

70 Physics (General) 206

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 209

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.*

72 Atomic and Molecular Physics 213

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

73 Nuclear Physics 215

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*.

74 Optics 220

Includes light phenomena and the theory of optical devices. For lasers see *36 Lasers and Masers*.

75 Plasma Physics 226

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics*.

76 Solid-State Physics 227

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 234

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

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80 Social and Information Sciences (General) 239

Includes general research topics related to sociology; educational programs and curricula.

81 Administration and Management 240

Includes management planning and research.

82 Documentation and Information Science 243

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

84 Law, Political Science and Space Policy 249

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

85 Technology Utilization and Surface Transportation 250

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

88 Space Sciences (General) 250

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

89 Astronomy 251

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

90 Astrophysics 254

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

91 Lunar and Planetary Science and Exploration 261

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 291

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

93 Space Radiation 292

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.*

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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, OCTOBER 18, 2002

01
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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.

20020074718 Sul Ross State Univ., Dept. of Earth and Physical Sciences, Alpine, TX USA

A Manned Lunar Base for Determining the Three-Dimensional Make-Up of a Lunar Mare

Whitford-Stark, J. L., Sul Ross State Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 65; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

No one would disagree that the next stage of lunar exploration has to be a manned lunar base. The criteria for its establishment and the missions and professional qualifications of its inhabitants are largely constrained by subjective political and economic considerations. The Apollo and Luna missions demonstrated what could be achieved with thirty year old technology. The communications and miniaturization strides made in the intervening time frame allow for exploration and experimental techniques inconceivable to the earlier mission planners.

Author

Lunar Bases; Lunar Geology; Lunar Maria; Drilling; Space Missions

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.

20020074557 MCAT Inst., USA

Computational Analysis of Compressibility Effects on a High-Lift Wing

Baker, M. David, MCAT Inst., USA; [1999]; 1p; In English

Contract(s)/Grant(s): NAS2-14109; RTOP 538-14-14; No Copyright; Avail: Issuing Activity; Abstract Only

The objective of this study was to investigate compressibility effects on a high-lift flowfield by simulating the flow about a three-dimensional multi-element wing. The computations were performed by solving both the incompressible and compressible Navier-Stokes equations (using the INS3D and OVERFLOW codes) on structured, overset grids. Turbulence was modeled via the one-equation, fully turbulent Spalart-Allmaras model. The computational results were validated with surface pressure measurements acquired at the NASA Ames 7- by 10-Foot Wind Tunnel. The geometry used for all computations consisted of an unswept wing in a landing configuration with a half-span flap and a three-quarter-span slat mounted inside a rectangular duct approximating the wind tunnel walls. The solutions were carefully examined to account for effects due to differences in algorithms. Compressibility effects were demonstrated by comparing surface particle traces, sectional pressure coefficient and boundary layer profile plots. It was found that small regions of compressibility near the slat and main-element leading edge can largely impact the flow. Even small compressibility regions can have significant global effects on the circulation and separation of each of the high-lift elements.

Author

Computation; Compressibility Effects; Leading Edges; Wings; Pressure Measurement; Lifting Bodies

20020076286 NASA Ames Research Center, Moffett Field, CA USA

Rotor/Wing Interactions in Hover

Young, Larry A., NASA Ames Research Center, USA; Derby, Michael R., Aerospace Computing, Inc., USA; April 2002; 94p; In English

Contract(s)/Grant(s): RTOP 712-92-43

Report No.(s): NASA/TM-2002-211392; NAS 1.15:211392; A-0207202; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Hover predictions of tiltrotor aircraft are hampered by the lack of accurate and computationally efficient models for rotor/wing interactional aerodynamics. This paper summarizes the development of an approximate, potential flow solution for the rotor-on-rotor and wing-on-rotor interactions. This analysis is based on actuator disk and vortex theory and the method of images. The analysis is applicable for out-of-ground-effect predictions. The analysis is particularly suited for aircraft preliminary design studies. Flow field predictions from this simple analytical model are validated against experimental data from previous studies. The paper concludes with an analytical assessment of the influence of rotor-on-rotor and wing-on-rotor interactions. This assessment examines the effect of rotor-to-wing offset distance, wing sweep, wing span, and flaperon incidence angle on tiltrotor inflow and performance.

Author

Flow Distribution; Mathematical Models; Rotor Aerodynamics; Tilt Rotor Aircraft; Interactional Aerodynamics; Hovering; Aircraft Design

20020076406 ESDU International Ltd., London, UK

Drag of a rectangular cavity in a flat plate with a turbulent boundary layer, Part 2, Open and transitional flows

July 2000; In English; Available from ESDU International as part of the ESDU Series on Aerodynamics.

Report No.(s): ESDU-00007; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 00007 develops an empirical method for predicting the drag where the cavity length is small compared to its depth and the shear flow bridges the gap between the front and rear walls, with the dividing streamline ending in a stagnation point at or near the top of the rear wall, trapping one or more vortices in the cavity (i.e. open flow). A single trapped vortex is typical for depth-to-length ratios between 0.5 and 1. For lower depth-to-length values a tandem pair of vortices can arise, while for higher depth-to-length values vertically stacked double or even triple vortices may occur. Families of curves are given to suggest a lower limit of cavity depth-to-length ratio for open flow in terms of freestream Mach number and cavity width-to-length ratio. If the cavity length is long compared to its depth, the shear flow enters the cavity and attaches to the floor before separating to exit over the rear wall with a stagnation point near the top of the wall (i.e. closed flow); the closed flow case is treated in the companion document, ESDU 00006. A family of curves repeated from that document is given to suggest an upper limit of cavity depth-to-length ratio for closed flow in terms of freestream Mach number and cavity width-to-length ratio. For a given cavity width and depth, at given flow conditions, as the cavity length is progressively increased from zero there is a range of values over which, for subsonic freestream speeds, the flow type gradually changes from open to closed flow, with the flow entering the cavity over the front wall but not attaching to the floor before passing over the rear wall (i.e. transitional flow). For supersonic speeds a similar range exists but the change from open to closed flow is more complex and abrupt, passing through two intermediate stages (i.e. transitional-open and transitional-closed). ESDU 00007 continues the open flow prediction method smoothly into the transitional region. The interface region between transitional and closed flows, which is not precise and may need the construction of a short fairing, is discussed and illustrated by means of an example. Tables give the ranges of parameters covered by the method. It is assessed to predict the ratio of the drag coefficient, based on floor area, to the local skin friction coefficient at the cavity mid-length station (in the absence of the cavity) to within 2. However, that accuracy requires certain data to be excluded from the analysis, and for freestream Mach numbers greater than 0.5 their inclusion would lower the agreement to within 5. The concerns with the data are discussed and all the details of the analysis are explained. Worked examples illustrate the use of the method.

ESDU

Aerodynamic Drag; Cavities; Flat Plates; Prediction Analysis Techniques; Turbulent Boundary Layer; Vortices; Dimensions

20020076438 ESDU International Ltd., London, UK

Example of the application of constrained multivariate optimisation techniques to the design of aerofoil sections, Design point 1: Dual, geometry variation, Upper and lower surfaces, leading-edge shape, leading and trailing edge flap deflections, initial aerofoil: RAE 2822, CFD: Euler code and BVGK

April 2001; In English; Available from ESDU International as part of the ESDU Series on Transonic Aerodynamics.

Report No.(s): ESDU-01024; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01024 presents an example of the application of constrained multivariate optimization techniques illustrating the use of mixed Computational Fluid Dynamics options in a dual design point study. to demonstrate the capability of the method fully, two disparate design points have been deliberately selected, one transonic (Mach number 0.71, lift coefficient 0.75 and Reynolds number of 20 million) calculated by BVGK used in viscous mode, and the other supersonic (Mach number 1.4, lift coefficient 0.05) calculated by an inviscid Euler code. The basic aerofoil is RAE 2822. The optimization objective is to minimize a linear combination of the drag coefficient values at the two design points. Reduction of the objective function is to be sought by changes in the upper and lower surfaces, the leading edge shape, and by deflection of simple leading and trailing edge flaps hinged at 15 and 75 per cent of chord respectively. ESDU 01024 is one of a series illustrating the process of using such optimization techniques, indicating their advantages and revealing the kinds of problems that can arise. to facilitate this it is in narrative form. An introduction to the application of constrained multivariate optimization techniques to the design of aerofoil section shapes is given in ESDU 99019.

ESDU

Airfoil Profiles; Computational Fluid Dynamics; Multivariate Statistical Analysis; Design Optimization; Computer Aided Design; Aircraft Design

20020076439 ESDU International Ltd., London, UK

Subsonic pressure drag of boat-tails with negligible annular base area in the presence of a central propulsive jet

November 2001; In English; Available from ESDU International as part of the ESDU Series on Aerodynamics.

Report No.(s): ESDU 01012; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01012 provides an empirical graphical method for boat tail pressure drag at zero angle of attack and for jet pressure ratios of 1.5 to 4 derived from a correlation of wind tunnel data. The boat tails may be of circular or parabolic arc or other curved profile and the method also applies to cases in which the curved portion of the profile runs into a final conical portion tangentially. The body upstream of the boat tail must run into the boat tail without discontinuity. The nozzles were convergent and the minimum annular base area was defined as base diameter minus jet diameter not exceeding 0.01 of body maximum diameter. The best geometric correlating parameter was found to be the dimensionless slope of the cross-sectional area distribution, weighted by projected area, and five graphs give the boat-tail drag for Mach numbers of 0.6, 0.8, 0.9, 0.92 and 0.94 as a function of that parameter and jet pressure ratio. Equations are provided for that correlating parameter for the circular arc boat tail and for a circular arc profile running tangentially into a conical portion. The ranges of the flow conditions and dimensions of the models used in the correlation are tabulated (the jet flow was cold) and sketches show the drag coefficient based on the body maximum area was generally correlated to within 0.01. One case generated values outside that range and the reasons for that are considered. A brief discussion shows that the use of a cold jet flow leads to a pessimistic value of boat tail drag. Two fully worked examples illustrate the use of the method, one relating to a curved profile for which only the profile coordinates are known.

ESDU

Mathematical Models; Pressure Drag; Subsonic Flow; Wind Tunnel Tests; Boattails

20020076443 ESDU International Ltd., London, UK

Trailing vortex drag factors for wings with part-span trailing-edge flaps

November 2001; In English; Available from ESDU International as part of the ESDU Series on Aerodynamics.

Report No.(s): ESDU-01007; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01007 gives factors for the determination of the theoretical trailing vortex drag of straight-tapered or cranked wings, with or without camber and twist and with part-span trailing-edge plain flaps. The factors have been derived from the spanwise loading distributions generated by Multhopp-Richardson lifting-surface solutions, with some adjustment via two correction factors. The primary correction factor was derived to give agreement with the theoretical results of Item No. 74035 for plane wings; there the underlying spanwise loading came from a different lifting-surface solution with additional spanwise stations incorporated between the collocation stations to improve the accuracy of the downwash integration and so provide more reliable values of the vortex drag factor. A modification of the primary correction factor for application to wings with part-span flaps was derived from comparisons with an in-house vortex lattice model over a wide range of configurations. Data for plain flaps with a flap chord ratio of 0.3 are tabulated for 115 planforms and 47 flap span conditions. Selective graphical presentations are given to illustrate the variation of the drag factors with wing and flap geometry. A FORTRAN ESDUpac program, A0107, provides data for the general case. Guidance is given on the application of the method to flaps other than plain, and with possible chord extension, through the adoption of an effective plain flap chord that is chosen so that the center of incremental lift due to flap deflection matches that of the actual flap. Limitations on the use of the program are fully documented. Worked examples demonstrate the

use of the tabulated data and of the ESDUpac. One example includes the treatment of vortex drag as part of the total lift-dependent drag in the analysis of experimental data.
ESDU
Aerodynamic Drag; Trailing Edge Flaps; Vortices; Numerical Analysis; Wing Span

20020076444 ESDU International Ltd., London, UK
Effect of planform geometry on low speed pitch-break characteristics of swept wings
October 2001; In English; Available from ESDU International as part of the ESDU Series on Aerodynamics.
Report No.(s): ESDU 01005; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01005 provides a means of predicting the type of pitch-break likely to be encountered for a given wing planform shape at low speeds. The method has been developed for wings alone and wing-body configurations and is based on an analysis of a large quantity of experimental data. Either pitch-up or pitch-down can occur depending mainly on planform shape through its influence on the flow field. It was found that characterizing the planform by the parameter A tan alpha where A is aspect ratio and alpha is quarter-chord sweep was adequate to define the type of pitch-break. For A tan alpha less than 2.6 pitch-down occurred while for A tan alpha greater than 3 pitch-up occurred, with either type of break being possible for values in between. Where a planform has varying amounts of sweep across each semi-span, ESDU 76003 is used to define an ”equivalent” straight-tapered wing. The values of the geometrical parameters defining the range of planform shapes for which data were available are tabulated and show that the method applies to a wide range of wing planforms, including swept-forward geometries. Its high reliability is illustrated by sketches showing all the data used on plots of A versus tan alpha. Two fully worked examples illustrate the use of the method.
ESDU
Wing Planforms; Low Speed; Swept Wings; Pitch (Inclination); Body-Wing Configurations; Prediction Analysis Techniques

20020076445 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. fuer Aerodynamik und Stroemungstechnik, Goettingen, Germany
Drag Reduction by Wake Ventilation of Bluff Bodies at Higher Reynolds Numbers ***Widerstandsverminderung Durch Ventilation Stumpfer Koerper bei Hoeheren Reynoldszahlen***
Lu, Mei, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; 2001; ISSN 1434-8454; 138p; In German; Original contains color illustrations
Report No.(s): DLR-FB-2001-28; Copyright; Avail: Issuing Activity

Experimental investigations were conducted on flow control by passive ventilation of wakes of spheres and of bluff bodies with different length-to-diameter ratios consisting of circular cylinders with hemispherical front and rear ends, Wake ventilation is provided by a central tunnel along the model axis connecting the stagnation region in front of the body with the wake region at the rear. The ventilation effects on drag, lift and pitching moment were determined up to transcritical Reynolds numbers by tests in the Gottingen High Pressure Wind-Tunnel. In addition, surface pressure distributions were measured and flow visualisations conducted. Effects of model support geometry and of a single surface roughness were also investigated. The drag reduction, found already at low supercritical Reynolds numbers by other authors, was confirmed up to very high Reynolds numbers (A 10), reaching up to 66% for a sphere with a cross section of the ventilating tunnel of only about 2% of the model cross section. The ventilation effects for the elongated bluff bodies at zero angle of attack decrease with increasing length-to-diameter ratios; however this is not the case at angles of attack of 5 deg and 10 deg. The pitching moment of the ventilated sphere becomes negative (stabilizing) for positive angles of attack. However, for the elongated bluff bodies it becomes positive (destabilizing).
Author
Flow Distribution; Wind Tunnel Tests; Drag Reduction; Wind Tunnel Models; Ventilation; Wakes; Bluff Bodies; Spheres; Reynolds Number

20020076455 ESDU International Ltd., London, UK
Aerofoil and wing pitching moment coefficient increment at zero angle of attack due to deployment of leading-edge and trailing-edge high-lift devices in combination at low speeds
November 2001; In English; Available from ESDU International as part of the ESDU Series on Aerodynamics.
Report No.(s): ESDU-01013; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01013 predicts for aerofoils the center of lift position based on thin aerofoil theory with empirical correction. This is combined with the predicted increment in aerofoil lift coefficient from other ESDU documents to estimate the pitching moment coefficient increment. For wings with full-span devices, factors dependent on planform geometry are applied to the pitching moment coefficient increment on an aerofoil section that is representative of the wing in order to allow for three-dimensional

effects. For wings with part-span devices, additional factors are introduced that are dependent on the wing taper ratio and on the spanwise extent of the devices, and the effect of wing aspect ratio and sweep is also accounted for in the procedure. The method covers plain leading-edge flaps, drooped leading edges, slats, sealed slats, and vented and unvented Krueger flaps in combination with plain, split, slotted and multi-slotted trailing-edge flaps. The way the wing must be divided into portions containing either leading-edge devices, trailing-edge flaps, both or none prior to the application of the three-dimensional factors is described. The empirical factors that apply in the case of combined deployment have been derived to supplement those available from other ESDU documents for individual devices deployed alone. The method applies in free air and at Mach numbers below about 0.2. Sketches illustrate the accuracy of prediction and tables give the ranges of parameters covered in the construction of the method. For aerofoils, 91 per cent of the data for the increment in pitching moment coefficient are predicted to within 0.05. For wings, 95 per cent of the data for the increment in pitching moment coefficient are predicted to within 0.04. Worked examples illustrate the use of the method.
ESDU
Airfoils; Leading Edge Flaps; Pitching Moments; Trailing Edge Flaps; Wings; Prediction Analysis Techniques; Lift

20020076463 ESDU International Ltd., London, UK
Example of the application of constrained multivariate optimisation techniques to the design of aerofoil sections, Design point 2: Single, geometry variation, Upper and lower surfaces and camber line variation, initial aerofoils: NACA 012 and RAE 2822, CFD: BVGK (viscous)
April 2001; In English; Available from ESDU International as part of the ESDU Series on Transonic Aerodynamics.
Report No.(s): ESDU-01025; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01025 presents examples of the application of the constrained multivariate optimization technique CODAS to the inverse design of aerofoil sections, that is to determine the shape of aerofoil that has a specified pressure distribution at a given flow condition (Mach number, lift coefficient or incidence, Reynolds number). The first example demonstrates the ability of CODAS to obtain the shape of an aerofoil section which will match a specified complete pressure distribution. The target pressure distribution is taken as that obtained from a BVGK calculation of the flow around the RAE 2822 section at a Mach number of 0.73, incidence of 2 degree, Reynolds number of 6.5 million with transition at 5 per cent of chord on both surfaces. The inverse design process is started from a NACA 0012 section at a value of incidence of 1.5 degree (corresponding roughly to the expected lift coefficient) and the section is modified by increments to the upper and lower surfaces defined by their second derivatives at eight chordwise positions. For the second example the target is a shock-free upper surface pressure distribution at a Mach number of 0.72, a lift coefficient of 0.77 and a Reynolds number of 20 million. The starting aerofoil is taken as RAE 2822 and a revised camber line is sought which will give the required pressure distribution. ESDU 01025 is one of a series illustrating the process of using such optimization techniques, indicating their advantages and revealing the kinds of problems that can arise. to facilitate this ESDU 01025 is in narrative form. An introduction to the application of constrained multivariate optimisation techniques to the design of aerofoil section shapes is given in ESDU 99019.
ESDU
Airfoil Profiles; Airfoils; Multivariate Statistical Analysis; Design Optimization; Aircraft Design

20020076464 ESDU International Ltd., London, UK
VGK method for two-dimensional aerofoil sections, Part 6, Aerofoil with simple hinged flaps
January 2001; In English; Available from ESDU International as part of the ESDU Series on Transonic Aerodynamics.
Report No.(s): ESDU-01033; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01033 is the sixth in a sequence to accompany the VGK method for two-dimensional aerofoil sections. VGK is a CFD (computational fluid dynamics) method coded in FORTRAN for predicting the aerodynamic characteristics of a two-dimensional aerofoil in a subsonic freestream, including the effects of viscosity (boundary layers and wake) and shock waves. VGK uses an iterative approach to solve coupled finite difference equations for the inviscid flow region (assumed to be potential) and the viscous flow region (represented by integral equations). It was developed over a period of years at RAE (now DERA) Farnborough, and is made available by ESDU under the terms of an agreement with DERA. Crown copyright is retained in the VGK source code. ESDU 01033 extends the VGK method to deal with an aerofoil with simple hinged flaps. These may be either leading- or trailing-edge flaps, or both types may be present together. The method is restricted to small deflections of effectively sealed flaps, since there is no modelling of any flow through a gap between a flap and the main aerofoil element, nor are the details of the flow near any irregularity in the surface contour produced by flap deflection represented. Procedures (and associated programs) for generating the surface coordinates of an aerofoil with deflected flaps are described, with deflection being represented either by rotation or by shearing. In each case smoothing may be applied to the regions where a flap and main aerofoil element meet. The additional functions incorporated in the flow program (VGKSF) in order to deal with a flapped aerofoil are

presented. Use of the programs is described in detail and covers the calculation of aerodynamic characteristics (including hinge-moment coefficient) for a series of flap deflection angles. A number of comparisons of VGKSF calculations with other results are presented, followed by an assessment of the accuracy of VGKSF predictions of aerodynamic characteristics.
ESDU
Aerodynamic Characteristics; Airfoil Profiles; Airfoils; Computational Fluid Dynamics; Finite Difference Theory; Predictions

20020076467 ESDU International Ltd., London, UK
Drag of a rectangular planform cavity in a flat plate with a turbulent boundary layer for Mach numbers up to 3, Part 1, Closed flow
March 2000; In English; Available from ESDU International as part of the ESDU Series on Aerodynamics.
Report No.(s): ESDU-00006; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 00006 develops a method for predicting the drag where the cavity length is large compared to the depth and the shear flow enters the cavity and attaches to the floor before separating to pass over the rear wall with a stagnation point near the top of the wall (i.e. closed flow). A family of curves suggests an upper limit of cavity depth to length ratio for closed flow in terms of freestream Mach number and cavity width to length or width to height ratio. In supersonic flow it is possible for vortices to form as the shear flow spills over the side edges of the cavity and their impingement on the rear wall gives rise to an increase in drag for which an estimation method is also provided. Tables give the ranges of parameters covered in the construction of the method. It is assessed to predict the ratio of the drag coefficient, based on floor area, to the local skin friction coefficient at the cavity mid-length station (in the absence of the cavity) to within 1 for low speed flow (Mach number less than 0.1) and to within 2 for high-speed flow (Mach number between 0.5 and 3). Worked examples illustrate the use of the method. A companion ESDU document, ESDU 00007, deals with other types of cavity flow, known as transitional and open as opposed to closed to identify different flow regimes.
Author
Aerodynamic Drag; Cavities; Flat Plates; Rectangular Planforms; Turbulent Boundary Layer; Prediction Analysis Techniques; Shear Flow

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.

20020074978 Purdue Univ., Dept. of Aviation Technology, West Lafayette, IN USA
Ethics Education in University Aviation Management Programs in the US, Part 1, The Need
Oderman, Dale B., Purdue Univ., USA; Journal of Air Transportation World Wide; 2002; ISSN 1093-8826; Volume 7, Nos. 2-3, pp. 3-30; In English; Copyright; Avail: Issuing Activity

This three-part study examines how four-year universities in the United States with baccalaureate programs in aviation management include ethics instruction in their curricula. Based on a literature review, no research exists to describe the current status of teaching ethics to aviation students. Yet concurrently, unethical activities reported in the media involving the aviation industry indicates the need for such programs. Part One of this study justifies the need for ethics education and develops a series of hypotheses to evaluate the current status of ethics instruction, which was investigated and will be reported on in Parts Two and Three of this study, respectively.
Author
Aircraft Industry; Ethics; Aeronautics; Education

20020075054 Southern Cross Univ., School of Commerce and Management, New South Wales, Australia
Strategic Classification and Examination of the Development of Current Airline Alliance Activities
Wang, Zhi H., Southern Cross Univ., Australia; Evans, Michael, Southern Cross Univ., Australia; Journal of Air Transportation World Wide; 2002; ISSN 1093-8826; Volume 7, Nos. 2-3, pp. 73-101; In English; Copyright; Avail: Issuing Activity

Previous research argues that despite the fact that strategic alliances have become an important feature of the world airline industry, little rigorous analysis has been done on the effects of these alliances. This is partially because there is a lack of precise definitions to specify different types of airline alliances in the literature. This research identifies several categories of airline

alliances through a strategic classification of the current alliance activities involving the major airlines for the period 1989 to 1999. The classification enables this research to examine how strategic alliance activities are evolving, particularly to compare how airlines in North America, the European Union and the Asia Pacific region have committed to different alliances. Findings show that there is a significant difference between the number and scope of alliances adopted in the three aviation markets. These findings facilitate research to further analyse the impact of market liberalization on various formations of strategic airline alliances.
Author
Airline Operations; Civil Aviation; North America; Air Transportation

20020075712 Civil Aeromedical Inst., Civil Aeromedical Inst., Oklahoma City, OK USA
Contact Lens Use in the Civil Airman Population ***Final Report***
Nakagawara, Van B.; Wood, Kathryn J.; Montgomery, Ron W.; May 2002; 14p; In English
Report No.(s): AD-A404962; DOT/FAA/AM-02/6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Since 1976, the use of contact lenses by civilian pilots has been permitted to correct distant vision for obtaining a Federal Aviation Administration (FAA) aeromedical certificate. Although contact lens technology has advanced dramatically in recent years, the aviation environment may still have adverse effects on contact lens performance in some flight situations. This study examined the civil airman population's experience with contact lens use for a 30-year period (1967-97). The information will help guide future medical certification decisions, policy revisions, and education safety programs for aeromedical and flight crew personnel. The FAA's Aerospace Medical Certification Division provided population totals for 1 January 1967 through 31 December 1997 of airmen who carried a pathology code for contact lens use (code 161) or orthokeratology (code 158). These data were stratified by class of medical certificate and age. Prevalence rates were calculated using the population frequencies from the annual Aeromedical Certification Statistical Handbook (AC 8500-1). A search of the National Transportation Safety Board (NTSB) and FAA databases was performed to determine if contact lens use had contributed to any aviation mishaps (accidents or incidents). RESULTS: The prevalence of contact lens use grew faster for first-class medical certificate holders (1.6/1,000 to 32.3/1,000 airmen) and airmen greater than 40 years of age (3.711,000 to 34.2/1,000 airmen) during the study period. The frequency of airmen with orthokeratology increased by 23 times in a 10 years period. Reports from five aviation accidents and one incident suggested that contact lens use was a contributing factor in the mishap. Professional pilots and older airmen are more inclined to use contact lenses to satisfy the aeromedical vision standards. Contact lenses can be a liability in some flight situations but have performed well for the majority of aviators.
DTIC
Civil Aviation; Contact Lenses; Aircraft Safety

20020075714 Secretary of the Air Force, Washington, DC USA
Flying Operations: A/OA-10 -- Aircrew Evaluation Criteria. Volume 2
Dec. 08, 2000; 47p; In English
Report No.(s): AD-A404960; AFI11-2A/OA-10-VOL-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This change clarifies Forward Air Control (FAC) mission evaluations to ensure air to surface evaluation requirements/grading criteria will be used on all mission evaluations.
DTIC
Flight Crews; Flight Training; Armed Forces (USA)

20020075715 Hughes Technical Center, Atlantic City International Airport, NJ USA
An Investigation of the Effect of Number of Time Steps on Ice Shapes Calculated by an Ice Accretion Code ***Final Report***
Riley, James; McDowall, Rosemarie; Apr. 2002; 13p; In English; Prepared in cooperation with Galaxy Scientific Corp., Egg Harbor Twp., NJ
Report No.(s): AD-A404957; DOT/FAA/AR-02/1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A brief investigation was conducted of the effect of the number of time steps used by the ice accretion code LEWICE 2.0 in determining an ice shape. The investigation included a study of the LEWICE 2.0 validation database and approximately 30 additional LEWICE 2.0 rims. For more than 90 percent of LEWICE 2.0 cases in the validation database, the number of time steps used in calculating the ice shape was different from the 'default' number of time steps determined by LEWICE 2.0 with the automatic time-stepping feature on. In all these cases, the number of time steps was equal to the IFLO input value, which was determined in accordance with a 'minutes rule'. The authors recommend that the minutes rule be incorporated into LEWICE 2.050 that the default number of time steps determined by LEWICE 2.0 is consistent with the number of time steps used for the runs in the validation database. The accuracy of LEWICE 2.0 when using the current default number cannot be determined from the

validation database. It was also found that the accuracy of LEWICE 2.0 ice shapes does not improve when the number of time steps is increased beyond a certain value. Specifically, when the number of time steps is increased beyond about 25 or 30, depending on the conditions, the ice shape predictions tend to diverge, and the upper horn (if present) tends to 'droop'. The authors recommend that the LEWICE 2.0 user be warned against inputting too large a number of time steps.
DTIC
Ice Formation; Data Bases

20020075716 Secretary of the Air Force, Washington, DC USA
Flying Operations
Feb. 11, 2000; 111p; In English
Report No.(s): AD-A404967; AFI11-2A/OA-10-VOL-1; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This Air Force instruction reviews ground and flying training requirements/ programs for Combat Air Forces (CAF) units.
DTIC
Flight Crews; Flight Training

20020076166 Transportation Research Board, National Cooperative Highway Research Program, Washington, DC USA
Aviation Demand Forecasting: A Survey of Methodologies, August 2002
Aug. 2002; 54p
Report No.(s): PB2002-108921; TRB-E-C040; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
Air passenger demand is related to such factors as the number of persons in a region and their motivation to travel (propensity to travel), socioeconomic activities and measures that support travel, and the availability of service and infrastructure. Forecasting at the local level should ideally take all of these influences into consideration. A major assumption underlying most forecasts is that there exists a correlation between demand and generating factors derived on the basis of historical data, and that this correlation is (to varying degrees) applicable for the forecasting horizon. Numerous assumptions related to expected future environments are made and used as input to the forecasting process. These assumptions are most likely to be a set of other forecasts derived independently, (e.g., future fare level, future service, future gross national product, and the like). It is the logic used and methodology applied to predict the relationship between the factors that creates variations among demand forecasts. For major airports, the relation between connecting (transfer) passengers and local origination or destination (O-D) traffic needs to be specified.
NTIS
Weather Forecasting; Civil Aviation; Airports; Economics; Air Transportation

20020076257 Alabama Univ., Dept. of Civil and Environmental Engineering, Tuscaloosa, AL USA
Comparing Airport Licensing Requirements: Alabama verse Selected States and the FAA ***Final Report, 2001 Jan. 1 - 01 Dec. 01***
Smith, D. Z.; Abraham, R.; Haynes, C. D.; Dec. 31, 2001; 40p; In English
Report No.(s): PB2002-107293; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Many states in the USA of America have licensing requirements for their general use airports. The objective of this study was to determine if current Alabamas regulations for general use airports are timely and if they compare favorably with selected states. Alabamas requirements were compared with several adjacent states, other states s elect because of good reputations for airport administration, and with guidelines from the Federal Aviation Administration. The results of this study are presented in this report as a discussion contrasting Alabama licensing requirements with others. A spreadsheet in the appendix provides a line item comparison of each states airport licensing requirements. This study revealed that Alabama ranks highest among the sampled states in airport licensing requirements, but could consider incorporating several features from other states.
NTIS
Airports; Licensing; Spreadsheets

20020076358 National Aerospace Lab., Informatics Div., Amsterdam Netherlands
Scenario Management Tool SMARTFED for Real-Time Interactive High Performance Networked Simulations
van Sterkenburg, R. P.; ten Dam, A. A.; Dec. 1998; 22p; In English
Report No.(s): PB2002-105858; NLR-TP-98577; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The National Aerospace Laboratory NLR is the central aerospace research and development organization in the Netherlands, and is actively involved in international simulation projects. In the HPCN project SIMULTAAN, NLR develops a generic scenario management tool named SMARTFED for real-time monitoring and control of networked simulations. The scenario management

tool also offers functionalities to define and execute scenarios. A faster than realtime option of SMARTFED facilitates the use of HPCN visualization tools for evaluation purposes. This paper describes the tool SMARTFED and its use in networked high performance simulations. The envisaged use of SMARTFED in aerospace applications is further illustrated for NLR's DELTA federation.
NTIS
Air Traffic Control; Computer Networks; Flight Simulation

20020077958 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
Reliability Analysis for AFTI-F16 SRFCS Using ASSIST and SURE
Wu, N. Eva, Binghamton Univ., USA; [2001]; 6p; In English
Contract(s)/Grant(s): NCC1-336; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper reports the results of a study on reliability analysis of an AFTI-16 Self-Repairing Flight Control System (SRFCS) using software tools SURE (Semi-Markov Unreliability Range Evaluator and ASSIST (Abstract Semi-Markov Specification Interface to the SURE Tool). The purpose of the study is to investigate the potential utility of the software tools in the ongoing effort of the NASA Aviation Safety Program, where the class of systems must be extended beyond the originally intended serving class of electronic digital processors. The study concludes that SURE and ASSIST are applicable to reliability, analysis of flight control systems. They are especially efficient for sensitivity analysis that quantifies the dependence of system reliability on model parameters. The study also confirms an earlier finding on the dominant role of a parameter called a failure coverage. The paper will remark on issues related to the improvement of coverage and the optimization of redundancy level.
Author
Flight Control; Reliability Analysis; Control Systems Design; Software Engineering; Sensitivity Analysis; Mathematical Models

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.

20020074383 Defence Science and Technology Organisation, Salisbury, Australia
Converting GPS Coordinates (phil lambdal h) to Navigation Coordination (ENU)
Drake, S. P.; Apr. 2002; 25p; In English
Report No.(s): AD-A404846; DSTO-TN-0432; DSTO-AR-012-335; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In many applications relevant to the Australian Defence Force (ADF) it is necessary to convert the Global Positioning System (GPS) coordinates of latitude, longitude and height to a local navigation frame with coordinates, east, north and up. For example when testing navigation instruments, such as the inertial navigation system (INS), it is often helpful to compare these measurements with those obtained from an independent GPS receiver. An INS records the east, north and up displacement from its point of origin. to compare INS and GPS measurements we need to transform GPS coordinates to navigation coordinates. Furthermore, east, north, up coordinates are essential in determining the line of sight for terrain data given as latitude, longitude and height, such as digital terrain elevation data (DTED). For large amounts of data, e.g, trial data, this process may be very computationally intensive. Means for converting GPS data to navigation frame coordinates already exist. Row-ever, the method presented in this report is roughly three times faster than a commonly employed one. The coordinate transformation routine outlined in this report is accurate to within lOm over a range of 60km. The coordinate transformation method outlined here will be used in the Navwar simulation package currently under development in DSTO Edinburgh. It will have the effect of significantly reducing the processing time of line of sight calculations in jamming models.

20020074887 Civil Aeromedical Inst., Civil Aeromedical Inst., Oklahoma City, OK USA
Relationship of Employee Attitudes and Supervisor-Controller Ratio to En Route Operational Error Rates ***Final Report***
Broach, Dana M.; Dollar, Carolyn S.; May 2002; 13p; In English
Report No.(s): AD-A405141; DOT/FAA/AM-02/9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An operational error (OE) results when an air traffic control specialist (ATCS) fails to maintain appropriate separation between aircraft, obstacles, etc. Recent research on OEs has focused on situational and individual characteristics (Center for Naval Analyses Corporation, 1995; Della Rocco, 1999; Rodgers, Mogford, Mogford, 1998). In this study, the relationship of

organizational factors to en route OE rates was investigated, based on an adaptation of the Human Factors Analysis and Classification System (HFACS; Shappell & Wiegmann 2000) to air traffic control as HFACS-ATC (Scarborough & Pounds, 2001). OE rates (errors per 100,000 operations) for 1997 and 2000 were obtained from the National Airspace Incident Monitoring System (NAIMS) for 21 air route traffic control centers (ARTCC). Organizational factors were represented by facility mean scores on scales constructed from 1997 and 2000 FAA Employee Attitude Survey (EAS) data. Factors included employee perceptions of equipment/facilities, performance management, overall job satisfaction, and perceptions of other human resources management practices. The supervisor-controller ratio (SCR) was calculated for each ARTCC by year from agency personnel data. SCR and organizational factors facility mean scores were regressed on OE rate (N = 42). Two organizational factors and SCR accounted for 50% (adjusted R(sup 2) = .505, p is less than .001) of the variance in OE rates across ARTCCs for the two years. The standardized regression coefficients were - .290 for perceptions of equipment/facilities (t = - 2.07, p is less than .05), - .302 for perceptions of performance management (t = - 2.28, p is less than .05), and - .395 for SCR (t = - 3.360, p is less than .01). As expected from prior research, SCR was a significant predictor of en route CE rates. In addition, the results indicated that perceptions of how performance was managed and of facilities and equipment were also predictors of CE rates.
DTIC
Error Analysis; Air Traffic Control; National Airspace System; Classifications

20020076084 Swedish Defence Research Establishment, Stockholm, Sweden
GP and TS Manual: Global Positioning and Time Synchroniser
Lans, H.; Pihl, J.; Sundin, G.; Arvidsson, A.; Mar. 2001; 30p; In English
Report No.(s): PB2002-104997; FOI-R-0075-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A stable clock has been developed for synchronizing transmitter and receiver in a bistatic sonar system. The hardware for this GP&TS (Global Positioning and Time Synchronizer) has been described in a previous FOA report ('A GPS Based Time Synchronizer', 1999). The present report describes the GP&TS software, especially the PC Visual FORTRAN program, but also the assembler program in the clock itself and the communication protocol between clock and PC. It also gives a review of the electrical inputs and outputs of the clock. The report is intended to be used as a user manual and it contains a lot of screen dumps from the PC program. Some new applications for the clock are also pointed out.
NTIS
User Manuals (Computer Programs); Applications Programs (Computers)

20020076235 Swedish Defence Research Establishment, Stockholm, Sweden
Modelling a System for Direction Finding Based on TDOA ***Modellutveckling av ett TDOA Positioneringssystem.***
Larsson, M.; Jun. 2001; 54p; In Swedish
Report No.(s): PB2002-104678; FOI-R-0122-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This masters thesis details an attempt to build a short-wave radio direction finding device based on the principle of Time Difference of Arrival (TDOA). Some basic principles of radio direction finding are presented, followed by two methods for estimating time differences: the cross-correlation function and the phase slope of the cross-spectral density. The properties of the methods are investigated through simulations. Estimation by means of the phase slope makes less demand on the sample rate but is more sensitive to low signal to noise ratios. Two field experiments were conducted to investigate the real-life performance of the phase slope method. The test platform consisted of a 2-channel receiver and a mobile transmitter. Due to technical problems, the planned measurements could not be completed, probably caused by the receiver being modified and used for other purposes between the experiments. The results suggest, however, that it may be feasible to use TDOA and phase slope measurements for short-wave signals. The method needs refining: high signal to noise ratios are currently necessary and the signals type modulation affects the results. New algorithms must therefore be developed.
NTIS
Direction Finding; Mathematical Models; Time Functions; Algorithms

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.

20020074811 Micro Analysis and Design, Boulder, CO USA
Using Simulation Models to Analyze the Effects of Crew Size and Crew Fatigue on the Control of Tactical Unmanned Aerial Vehicles (TUAVs) ***Final Report***
Walters, Brett A.; Huber, Shawn; French, Jon; Barnes, Michael J.; Jul. 2002; 35p; In English; Original contains color images
Contract(s)/Grant(s): DAAD17-00-A-5003
Report No.(s): AD-A405012; ARL*-CR-483; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes a study conducted by Micro Analysis and Design, Inc., for the U.S. Army Research Laboratory (ARL). One area of research examined by ARL was the staffing required to operate tactical unmanned aerial vehicles (TUAVs). The primary objective of the study was to use simulation modeling to analyze how fatigue, crew size, and rotation schedule affect operator workload and performance during the control of a TUAV. Computer simulation models were developed with the Micro Saint Discrete Event Simulation software to simulate the tasks that operators perform when controlling a TUAV. These models, which contain system-specific attributes of the Shadow 200 TUAV, included a fatigue function to predict performance effects for day and night missions. Subject matter experts (SMEs) provided the list of tasks involved in controlling a TUAV (during normal operations and emergencies), the order of these tasks, and the visual, auditory, cognitive, and psychomotor workload values associated with each task. Twelve different crew configurations were examined for the tactical operations center (TOC) and the launch and recovery station (LRS), which ranged in size from 8 to 15 crew members. The conclusions from executing the models and interviewing SMEs (during 12- and 18-hour missions) indicate that reducing the number of aerial vehicle operators (AVOs) and mission payload operators (MPOs) in the TOC can result in more aerial vehicle mishaps during emergencies, increased search time, and a decreased number of targets detected. For example, compared to six AVOs or MPOs in the TOC, the addition of two crew members resulted in only slight performance gains of a 6% increase in target detection and a 4% decrease in target search time. However, when the members of the crew were reduced to four AVOs or MPOs in the TOC, there was substantial performance loss (20% decrease in target detection and a 15% increase in target search time).
DTIC
Flight Crews; Human Performance; Pilotless Aircraft; Crew Size

20020074823 Woods Hole Oceanographic Inst., MA USA
An Aerostat/Elevated Antenna Component to Aid VHF Radiotelemetry and Tracking of Right Whales in Critical Habitats ***Final Report, 15 Aug. 1998-14 Aug 2001***
Hain, James H.; Aug. 2001; 5p; In English
Contract(s)/Grant(s): N00014-98-1-0853
Report No.(s): AD-A404859; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Elevating the receiving antenna in projects to monitor movements and behaviors of right whales, Eubalaena glacialis, in critical habitats will increase range and efficacy. This was accomplished by mounting the antenna and receiver on an aerostat (tethered balloon). At altitudes of 200 ft or greater, ranges of 15-20 miles can be expected. This project evolved to include other applications, and demonstrated the use of aerostats for carrying antenna arrays, instrument packages, sensors, and cameras to altitudes of several thousand feet. An emerging area in the field of environmental technology has been identified.
DTIC
Radio Telemetry; Antennas; Tracking (Position); Balloon-Borne Instruments

20020074883 Federal Aviation Administration, Willaim J. Hughes Technical Center, Atlantic City, NJ USA
Inerting a Boeing 747SP Center Wing Tank Scale Model With Nitrogen-Enriched Air ***Final Report***
Cavage, William M.; Kils, Ole; May 2002; 44p; In English
Report No.(s): AD-A405137; DOT/FAA/AR-02/51; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Tests were performed in a 0.24 scale model of a Boeing 747SP center wing tank to validate the existing assumptions for inerting complex geometric spaces, which were developed from previous experiments, and to facilitate design of an efficient, cost-effective inerting gas deposit system for full-scale, ground-based inerting testing. The model was equipped with a variable nitrogen-enriched air distribution system, thermocouples, and oxygen analyzers that were monitored and recorded continuously

by a data acquisition system during each test. The model was inerted in different configurations with different flow rates and bay distributions. The collected data was nondimensionalized in terms flow rate and tank size to allow for comparisons between tests. Experiments in the tank verified that the volumetric tank exchange established from research with a simple box-style tank can be achieved in a more complex compartmentalized tank. It also indicated that the same volumetric tank exchange could be obtained with less gas distribution (less complex distribution system) and that modification of the venting configuration to eliminate cross-venting would improve the efficiency of the inerting process. Tests showed that the most efficient method of inerting the tank was to deposit all the nitrogen-enriched air in a single location, allowing for a lightweight, easily installed deposit system for an operational aircraft. Data from full-scale testing compared well with scale tank data illustrating that low cost, small-scale test articles can be an effective tool for developing inert gas distribution systems.
DTIC
Transport Aircraft; Fuel Tanks; Ground Tests; Wing Tanks

20020075713 Secretary of the Air Force, Washington, DC USA
Flying Operations: A/OA-10 -- Operations Procedures. Volume 3
Feb. 11, 2002; 101p; In English
Report No.(s): AD-A404961; AFI11-2A/OA-10-VOL-3; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This volume outlines those procedures applicable to the safe operation of the A/OA-lO aircraft. With the complementary references cited, this volume prescribes standard operational procedures for all USAF A/OA-lO pilots. This volume, in conjunction with other governing directives, prescribes procedures for A/OA-10 aircraft under most circumstances, but is not to be used as a substitute for sound judgment or common sense. Operations or procedures not specifically addressed may be accomplished if they enhance safe, effective mission accomplishment. Deviations from these procedures require specific approval of the MAJCOM (ANG) unless an urgent requirement or an aircraft emergency dictates otherwise. In this case, the pilot in command will take the appropriate action to safely recover the aircraft. This instruction, in conjunction with the documents listed in the subparagraphs below, are the primary references for A/OA- 10 operating procedures. Training units may develop phase manuals from the procedures contained in these documents. Phase manuals may expand these basic procedures; however, in no case will they be less restrictive, nor will they change the procedures in these documents.
DTIC
A-10 Aircraft; Flight Training

20020076141 Boeing Co., USA
Innovations in Aircraft Design
Spinoff 1997; 1997, pp. 54; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The Boeing 777 carries with it basic and applied research, technology, and aerodynamic knowledge honed at several NASA field centers. Several Langley Research Center innovations instrumental to the development of the aircraft include knowledge of how to reduce engine and other noise for passengers and terminal residents, increased use of lightweight aerospace composite structures for increased fuel efficiency and range, and wind tunnel tests confirming the structural integrity of 777 wing-airframe integration. Test results from Marshall Space Flight Center aimed at improving the performance of the Space Shuttle engines led to improvements in the airplane's new, more efficient jet engines. Finally, fostered by Ames Research Center, the Boeing 777 blankets that protect areas of the plane from high temperatures and fire have a lineage to Advanced Flexible Reusable Surface Insulation used on certain areas of the Space Shuttle. According to Boeing Company estimates, the 777 has captured three-quarters of new orders for airplanes in its class since the program was launched.
Author
Aircraft Design; Structural Failure; Insulation; Composite Structures

20020076144 Hasbro, Inc., Pawtucket, RI USA
Toy Gliders
Spinoff 1997; 1997, pp. 75; In English; Original contains color illustrations; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Toy designers at Hasbro, Inc. wanted to create a foam glider that a child could fly with little knowledge of aeronautics. But early in its development, the Areo Nerf gliders had one critical problem: they didn't fly so well. Through NASA's Northeast Regional Technology Transfer Center, Hasbro was linked with aeronautical experts at Langley Research Center. The engineers provided information about how wing design and shape are integral to a glider's performance. The Hasbro designers received from NASA not only technical guidance but a hands-on tutorial on the physics of designing and flying gliders. Several versions of the

Nerf glider were realized from the collaboration. For instance, the Super Soaring Glider can make long-range, high performance flights while the Ultra-Stunt Glider is ideal for performing aerial acrobatics.
Author
Aerobatics; Aircraft Design; Foams; Gliders

20020076250 Phoenix Integration, Blacksburg, VA USA
Aircraft Design Software
Spinoff 1997; 1997, pp. 107; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Successful commercialization of the AirCraft SYNThesis (ACSYNT) tool has resulted in the creation of Phoenix Integration, Inc. ACSYNT has been exclusively licensed to the company, an outcome of a seven year, $3 million effort to provide unique software technology to a focused design engineering market. Ames Research Center formulated ACSYNT and in working with the Virginia Polytechnic Institute CAD Laboratory, began to design and code a computer-aided design for ACSYNT. Using a Joint Sponsored Research Agreement, Ames formed an industry-government-university alliance to improve and foster research and development for the software. As a result of the ACSYNT Institute, the software is becoming a predominant tool for aircraft conceptual design. ACSYNT has been successfully applied to high- speed civil transport configuration, subsonic transports, and supersonic fighters.
Author
Aircraft Design; Noise (Sound); Computer Aided Design; Aerodynamics; Propulsion; Computer Programs

20020076332 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China
Journal of Nanjing University of Aeronautics and Astronautics, Volume 34
Dewang, L.; Feb. 2002; 110p; In Chinese
Report No.(s): PB2002-106825; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The tow target system is used not only in the experiments of new weapons but also in the training of army, even if it can be extended to civil domains (for example, aerial survey and aerial photographs). This paper presents a tow target system developed by Nanjing University of Aeronautics & Astronautics. At first, its composing and working process is presented. Then its characteristics are listed and compared with other tow target systems in the world. The tow target studied by us is a full-scale tow target, which can simulate the properties of a missile in microwave, infraredrays, laser and light. At the same time, it can measure vector quantity of missing the target at the condition for keeping a level flight at super-low altitude. It is air-worthy at super-altitude over the sea, with high precision in holding the highness. and it is easier to be put down and taken back and cheaper in price.
NTIS
Development; Laser Outputs; Aerial Photography; Aircraft Reliability

20020076391 California Univ., San Diego, Dynamic Systems and Control Group, La Jolla, CA USA
Control Oriented Modeling and Validation of Aeroservoelastic Systems, *Jul. 2001 - Jun. 2002*
Crowder, Marianne, California Univ., San Diego, USA; deCallafon, Raymond, Principal Investigator, California Univ., San Diego, USA; [2002]; 3p; In English
Contract(s)/Grant(s): NGT4-52429; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Lightweight aircraft design emphasizes the reduction of structural weight to maximize aircraft efficiency and agility at the cost of increasing the likelihood of structural dynamic instabilities. to ensure flight safety, extensive flight testing and active structural servo control strategies are required to explore and expand the boundary of the flight envelope. Aeroservoelastic (ASE) models can provide online flight monitoring of dynamic instabilities to reduce flight time testing and increase flight safety. The success of ASE models is determined by the ability to take into account varying flight conditions and the possibility to perform flight monitoring under the presence of active structural servo control strategies. In this continued study, these aspects are addressed by developing specific methodologies and algorithms for control relevant robust identification and model validation of aeroservoelastic structures. The closed-loop model robust identification and model validation are based on a fractional model approach where the model uncertainties are characterized in a closed-loop relevant way.
Author
Light Aircraft; Aircraft Design; Mathematical Models; Aeroservoelasticity

20020076410 Old Dominion Univ., Virginia Space Grant Consortium, Hampton, VA USA

Virginia Space Grant Consortium Management of National General Aviation Design Competition ***Final Report, 1 Oct. 2000 - 30 Sep. 2001***

[2002]; 9p; In English

Contract(s)/Grant(s): NAG1-01047; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This report summarizes the management of the National General Aviation Design Competition on behalf of NASA, the FAA and the Air Force by the Virginia Space Grant Consortium (VSGC) for the time period October 1, 2000 through September 30, 2001. This was the VSGC's seventh and final year of managing the Competition, which the Consortium originally designed, developed and implemented for NASA and the FAA. The competition is now being managed in-house by NASA. Awards to winning university teams were presented at a ceremony held at AirVenture 2001, the Experimental Aircraft Association's Annual Convention and Fly-In at Oshkosh, Wis. by NASA and FAA officials. The competition called for individuals or teams of undergraduate and graduate students from U.S. engineering schools to participate in a major national effort to rebuild the U.S. general aviation sector. Participants were challenged to meet the engineering goals of the Advanced General Aviation Transport Experiment (AGATE) project. For the purpose of the contest, general aviation aircraft are typically defined as single or twin engine (turbine or piston), single-pilot, fixed-wing aircraft for 2 - 6 passengers. The competition seeks to raise student awareness of the importance of general aviation by having students address design challenges for a small aircraft transportation system. NASA, AFRL and the FAA hope to stimulate breakthroughs in technology and their application in the general aviation marketplace. National goals for revitalizing the industry offer excellent, open-ended design challenges with real world applications for the Innovative Design Category. Both individual and team submissions were encouraged. University faculty advisors and students consistently cite the value of this kind of educational experience for their engineering students. Eight proposals were submitted for the 2001 Competition for the Innovative Design Category. Eleven faculty members and 124 students participated. Since inception, more than 785 students and 60 faculty members have participated in the Competition. A review panel comprised of general aviation experts from the FAA, EAA, NASA and industry representatives reviewed the design packages and selected the winners. The VSGC coordinated marketing of the competition to a mailing list which included selected deans and department chairs from ABET-accredited institutions, Space Grant affiliates, faculty who had previously participated in or expressed interest in the Competition, and others.

Author

Aircraft Configurations; General Aviation Aircraft; Research Aircraft; Education

20020076468 ESDU International Ltd., London, UK

Example of statistical analysis of wet runway friction: Ground-test machine data

October 2000; In English; Available from ESDU International as part of the ESDU Series on Aircraft Performance.

Report No.(s): ESDU-00018; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU (Engineering Sciences Data Unit) 00018 is the third of a series of examples of the application of a method for representing and, if necessary, relating the braking performances of aircraft and ground test machines in wet conditions. The method, which is given in ESDU 99015, is essentially statistical and implies there is a clearly defined level of probability that can be deduced from test runs of an aircraft (or ground test machine) in a given set of wetness conditions on a particular runway. If the runway macro-texture depth is known, then the parameter that defines the variation of effective coefficient of braking friction in the given conditions can be readily calculated from a pre-determined Friction Data Base. The concept of a Friction Data Base is explained in ESDU 99015. This example uses data for the Mu-Meter ground-test machine operating both on wetted runways and in self-wetting mode. The background to the tests is described, the method of analysis is summarised and results are presented. Mu-Meter friction measurements are available from widely differing test series - to the extent that the suitability of the various results for use in predicting aircraft stopping performance can be assessed as a function of the ranges of runway wetness conditions used. The first example, for an aircraft where an extensive set of data is available, is given in ESDU 99016. The second example, for an aircraft where only a limited set of data is available, is given in ESDU 99017. If the method of ESDU 99015 is to be used to relate the braking performances of a given combination of aircraft and ground-test machine, the procedure is comprised of two distinct phases. The first is the establishment of separate Friction Data Bases for the aircraft and for the ground-test machine. The second is to predict operational braking performance of the aircraft from day-to-day measurements from the ground-test machine.

ESDU

Braking; Friction; Performance Prediction; Runway Conditions; Runways; Statistical Analysis; Probability Theory; Aircraft Performance

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.

20020074899 Logicon Technical Services, Inc., Dayton, OH USA
Instrument Scan Strategies of F-117A Pilots ***Final Report, Nov. 1998-May 1999***
Brown, David L.; Bautsch, Holly S.; Wetzel, Paul A.; Anderson, Gretchen M.; Feb. 2002; 16p; In English; Prepared in cooperation with Raytheon Systems Co., Lexington, MA
Contract(s)/Grant(s): Proj-7184
Report No.(s): AD-A405103; AFRL-HE-WP-TR-2002-0027; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Eye tracking is an accurate and objective means of measuring an instrument scan pattern. The purpose of this study was to determine if prior aircraft experience, phase of flight, and autopilot mode modulated the instrument scan pattern of F-117A pilots. Twenty-three F-117A pilots, grouped by prior experience, flew an instrument approach manually and with autopilot while wearing and El Mar eye tracker in the F-117A simulator at Holloman AFB NM. Number if fixations, dwell time, and percent total dwell time spent on nine individual instruments was collected and analyzed. The primary flight instrument was determined on the basis of pilot experience, and usage of the primary flight instrument varied significantly with phase of flight and manual vs. autopilot when ANOVA analysis was performed. Prior aircraft experience affects development of an instrument scan in a new aircraft. Prolonged dwell times on the primary flight instrument and change in fixations/dwell time during autopilot mode have implications for instrument design as well as cognitive load during novel situations. Further studies should be pursued.
DTIC
Fighter Aircraft; Eye Movements; Flight Instruments; Instrument Approach; Aircraft Pilots

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.

20020074377 Naval Postgraduate School, Monterey, CA USA
Improved Aerothermodynamic Instrumentation of an Allison T63-A-700 Gas Turbine Engine
Bruan, Kenneth C.; Jun. 2002; 59p; In English; Original contains color images
Report No.(s): AD-A404746; No Copyright; Avail: CASI; A04, Hardcopy

This document describes the design, installation, and operation of an improved measurement system for the aerothermodynamic flow path states in an Allison T63-A-700 (C250-18 civilian designation). Temperature measurements for the gas generator turbine and exhaust state points were evaluated and average values were calculated. The measurement uncertainty for airflow, fuel flow, and output power has been reduced to less than 3 percent. State points match installation design data within 3 percent. The digital scanning array has improved the accuracy of the pressure measurements and added the ability to measure pressure differences over time. The added bellmouth pressure sensors provide a redundant pressure measurement that is more accurate than the dynamometer system. The gas generator turbine inlet and exhaust temperature profiles have been measured and show that the temperature profile becomes less symmetrical with increasing air and fuel flow. The measurement values for the gas generator inlet temperature have been consolidated into a single value that is about 50 degrees different from expected values. The temperature profile at the power turbine inlet shows how the hot spot at the gas generator turbine inlet is affected by the swirl produced by the power turbine stages. The time resolved fluctuations in pressure between the compressor and gas generator turbine have been measured and show that compressor discharge and gas generator turbine inlet pressures are similar.
DTIC
Measuring Instruments; Aerothermodynamics; Pressure Measurement; Gas Turbine Engines

20020075587 Atlantic Research Corp., Gainesville, VA USA
Worldwide Developments in Ramjet-Powered Missiles (Update From 1995 Situational Review)
Hewitt, P. W., Atlantic Research Corp., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp.

449-462; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

In 1995 a study was undertaken to review worldwide developments in ramjet-powered missiles, with a principal focus on recent developments in, and current plans for, these missiles. The study, derived primarily from open literature, corporate knowledge and private communications, examined the issue from a situational, rather than a technical, perspective. In the past seven years there have been significant developments in the US and worldwide that deserve additional discussion. Ramjet anti-ship missiles continue to proliferate and the US has responded with a ramjet missile target development and related weapon studies. Anti-radiation missiles, time-critical strike missiles, and air-air missiles are also in development. Several historical and current programs at ARC are helping to close the gap in US capabilities relative to other nations.

Author

Ramjet Missiles; Missile Design; Time Dependence

20020075717 Environmental Quality Management, Inc., Cincinnati, OH USA

Aircraft Engine and Auxiliary Power Unit Emissions Testing: Final Report. Addendum. F119-PW-100 Engine Emissions Testing Report ***Final Report***

Gerstle, Thomas; Virag, Peter; Wade, Mark D.; Brown, Phillip P.; Jun. 2002; 251p; In English; Prepared in collaboration with Roy F. Weston Inc., West Chester, PA and Karta Technology Inc., San Antonio, TX. See also Volume 1, ADA361474, Volume 2, ADA361475, and Volume 3, ADA361473

Contract(s)/Grant(s): F41624-95-D-9019

Report No.(s): AD-A404966; IERA-RS-BR-SR-2002-0006; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This report is the product of a 5 year emissions testing program designed to document, characterize, and evaluate emissions from seventeen aircraft engines, two helicopter engines, and two auxiliary power units (APUs) burning JP-8 fuel. The purpose of this engine testing program was to develop emission factors for the tested engines under representative engine load conditions. All testing was performed by the Environmental Quality Management, Inc. (EQ) and Roy F. Weston, Inc. (Weston) team. Testing was conducted for criteria pollutants and select hazardous air pollutants (HAPs), e.g., aldehyde/ketones and semivolatile and volatile organic compounds.

DTIC

Aircraft Engines; Exhaust Emission

20020076127 NASA Glenn Research Center, Cleveland, OH USA

Effects of High-Temperature Exposures on the Fatigue Life of Superalloy Udimet(Registered Trademark) 720

Gabb, Timothy P., NASA Glenn Research Center, USA; Telesman, Jack, NASA Glenn Research Center, USA; Kantzos, Peter T., Ohio Aerospace Inst., USA; Sweeney, Joseph W., Akima Corp., USA; Browning, Paul F., Solar Turbines International, USA; July 2002; 16p; In English; 131st Annual Meeting and Exhibition, 17-21 Feb. 2002, Seattle, WA, USA; Sponsored by Minerals, Metals and Materials Society, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 708-24-13

Report No.(s): NASA/TM-2002-211570; NAS 1.15:211570; E-13354; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study was to examine the effects of extended exposures on the near-surface fatigue resistance of a disk superalloy. Powder metallurgy processed, supersolvus heat-treated Udimet 720 (U720) fatigue specimens were exposed in air at temperatures from 650 to 705 C for 100 hr to over 1000 hr. They were then tested using conventional fatigue tests at 650 C to determine the effects of exposure on fatigue resistance. The exposures reduced life by up to 70% and increased the scatter in life, compared to unexposed levels. Fractographic evaluations indicated the failure mode was shifted by the exposures from internal to surface crack initiations. The increased scatter in life was related to the competition between internal crack initiations at inclusions or large grains producing longer lives, and surface crack initiations at an environmentally affected surface layer producing shorter lives.

Author

Fatigue Life; Udimet Alloys; High Temperature; Heat Resistant Alloys; Fatigue Tests; Crack Initiation

20020076201 NASA Glenn Research Center, Cleveland, OH USA

Initial Assessment of the Effects of Nonmetallic Inclusions on Fatigue Life of Powder-Metallurgy-Processed Udimet(TM) 720

Gabb, T. P., NASA Glenn Research Center, USA; Telesman, J., NASA Glenn Research Center, USA; Kantzos, P. T., Ohio Aerospace Inst., USA; Bonacuse, P. J., Army Research Lab., USA; Barrie, R. L., Army Research Lab., USA; August 2002; 18p;

In English; Advanced Materials and Processes for Gas Turbines Symposium, 22-26 Sep. 2002, Copper Mountain, CO, USA; Sponsored by United Engineering Foundation, Inc., USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-24-13; DA Proj. 1L1-61102-AH-45
Report No.(s): NASA/TM-2002-211571; E-13355; NAS 1.15:211571; ARL-TR-2804; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The fatigue lives of modern powder metallurgy (PM) disk alloys are influenced by variabilities in alloy microstructure and mechanical properties. These properties can vary due to the different steps of materials/component processing and machining. One of these variables, the presence of nonmetallic inclusions, has been shown to significantly degrade low-cycle fatigue (LCF) life. Nonmetallic inclusions are inherent defects in powder alloys that are a by-product of powder-processing techniques. Contamination of the powder can occur in the melt, during powder atomization, or during any of the various handling processes through consolidation. In modern nickel disk powder processing facilities, the levels of inclusion contamination have been reduced to less than 1 part per million by weight. Despite the efforts of manufacturers to ensure the cleanliness of their powder production processes, the presence of inclusions remains a source of great concern for the designer. the objective of this study was to investigate the effects on fatigue life of these inclusions. Since natural inclusions occur so infrequently, elevated levels of inclusions were carefully introduced in a nickel-based disk superalloy, Udimet 720 (registered trademark of Special Metals Corporation), produced using PM processing. Multiple strain-controlled fatigue tests were then performed on this material at 650 C. Analyses were performed to compare the LCF lives and failure initiation sites as functions of inclusion content and fatigue conditions. A large majority of the failures in specimens with introduced inclusions occurred at cracks initiating from inclusions at the specimen surface. The inclusions could reduce fatigue life by up to 100 times. These effects were found to be dependent on strain range and strain ratio. Tests at lower strain ranges and higher strain ratios produced larger effects of inclusions on life. Author

Nickel Alloys; Metal Powder; Fatigue Life; Udimet Alloys; Fatigue Tests

20020076383 Rolls-Royce Allison, Indianapolis, IN USA

Lobed Mixer Design for Noise Suppression: Plume, Aerodynamic and Acoustic Data, Volume 2

Mengle, Vinod G., Rolls-Royce Allison, USA; Baker, V. David, Rolls-Royce Allison, USA; Dalton, William N., Rolls-Royce Allison, USA; July 2002; 632p; In English
Contract(s)/Grant(s): NAS3-27394; RTOP 781-30-12
Report No.(s): NASA/CR-2002-210823/VOL2; E-12741/VOL2; NAS 1.26:210823/VOL2; EDR-18581/VOL2; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

A comprehensive database for the acoustic and aerodynamic characteristics of several model-scale lobe mixers of bypass ratio 5 to 6 has been created for mixed jet speeds up to 1080 ft per s at typical take-off (TO) conditions of small-to-medium turbofan engines. The flight effect was simulated for Mach numbers up to 0.3. The static thrust performance and plume data were also obtained at typical TO and cruise conditions. The tests were done at NASA Lewis anechoic dome and ASE's FluiDyne Laboratories. The effect of several lobe mixer and nozzle parameters, such as, lobe scalloping, lobe count, lobe penetration and nozzle length was examined in terms of flyover noise at constant altitude and also noise in the reference frame of the nozzle. This volume is divided into three parts: in the first two parts, we collate the plume survey data in graphical form (line, contour and surface plots) and analyze it; in part 3, we tabulate the aerodynamic data for the acoustics tests and the acoustic data in one-third octave band levels.
Author

Data Bases; Engine Noise; Statistical Analysis; Noise Reduction; Acoustic Properties; Aerodynamic Characteristics; Turbofan Engines; Plumes; Jet Aircraft Noise

20020076457 ESDU International Ltd., London, UK

Computer-based estimation procedure for coaxial jet noise. Including far-field, subsonic jet mixing noise database for stationary, coplanar conical nozzles

May 2001; In English; Available from ESDU International as part of the ESDU Series on Aircraft Noise.
Report No.(s): ESDU-01004; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01004 provides a computerized method for estimating exhaust noise spectra from a database. The variables considered in the interpolation/extrapolation routine make the procedure particularly applicable to estimating noise from coaxial jets. The computation involves a least-squares fitting procedure where either two or three independent variables may be used. Two of these variables are fixed and the third independent variable may be defined by the user. Appropriate weighting of the data is included. The program uses quadratic interpolation within the least-squares fitting procedure. The computer program may be run using the comprehensive database included that applies to far-field, jet mixing noise from stationary jet engines with conical nozzles.

However, other databases can be used and ESDUpac C1004 is provided to assist users in creating a new database with their own data that can include other noise components of coaxial jet noise (for example, combustion noise, shock noise, etc) or in expanding an existing database using fresh data. The program is provided as ESDUpac A1004 for file input; program B1004 is included to assist in creating such files conveniently. to facilitate data transfer between programs in the Aircraft Noise Series a standardized format for a common file has been formulated and is described.
ESDU
Aeroacoustics; Aerodynamic Noise; Estimating; Computer Techniques; Data Bases; Jet Aircraft Noise; Jet Mixing Flow; Noise Spectra

20020076460 ESDU International Ltd., London, UK
Far-field sound radiation from circular ducts
December 2001; In English; Available from ESDU International as part of the ESDU Series on Aircraft Noise.
Report No.(s): ESDU 01015; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01015 introduces FORTRAN computer programs for a theoretical method for the prediction of the axisymmetric far-field sound radiation pattern resulting from the terminating end of an unflanged, hard-walled circular section duct. The effect of an external flow is also included. The method is applicable to aircraft jet engines and to large exhaust stacks and mufflers. The two programs are provided as source code and as executable versions, one calculating the pressure in the far-field at chosen angles to the duct axis forwards or rearwards and the other assisting the user in creation of the required input file. The pressures may be calculated for five possible cases: a single mode, or for multimodes with the user choosing a uniform distribution of either dipoles or monopoles over the exit plane, equal power in each mode, or specifying the modes and amplitudes. Two worked examples illustrate the use of the program. No comparison is made with experimental data but it is indicated that the literature shows the method to be in good agreement with results obtained with a turbo-fan engine. The theoretical method is summarized and its assumptions and limitations are briefly indicated.
ESDU
Applications Programs (Computers); Ducts; Sound Waves; Noise Prediction; Prediction Analysis Techniques

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.

20020076128 Dynamic Engineering, Inc., Newport News, VA USA
Aircraft Flutter Testing
Spinoff 1997; 1997, pp. 62; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Wilmer Reed gained international recognition for his innovative research, contributions and patented ideas relating to flutter and aeroelasticity of aerospace vehicles at Langley Research Center. In the early 1980's, Reed retired from Langley and joined the engineering staff of Dynamic Engineering Inc. While at DEI, Reed conceived and patented the DEI Flutter Exciter, now used world-wide in flight flutter testing of new or modified aircraft designs. When activated, the DEI Flutter Exciter alternately deflects the airstream upward and downward in a rapid manner, creating a force similar to that produced by an oscillating trailing edge flap. The DEI Flutter Exciter is readily adaptable to a variety of aircraft.
Author
Flutter; Flight Tests; Trailing Edge Flaps

20020076140 Orbital Research, Inc., USA
Wing Flutter Control
Spinoff 1997; 1997, pp. 57; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Through Small Business Innovation Research (SBIR) contracts from Langley Research Center, Orbital Research Inc. developed the Orbital Research Intelligent Control Algorithm (ORICA), the first practical hardware-independent adaptive predictive control structure, specifically suited for optimal control of complex, time-varying systems. ORICA technology has been applied to the problem of controlling aircraft wing flutter. Coupled with NASA expertise, the technology has the possibility of making jet travel safer, more cost effective by extending distance range, and lowering overall aircraft operating costs. Future

application areas for ORICA include control of robots, power trains, systems with arrays of sensors, or regulating chemical plants or electrical power plant control.
Author
Wing Oscillations; Control Systems Design; Algorithms; Adaptive Control

20020076148 ITHACO, Inc., Ithaca, NY USA
Attitude Control
Spinoff 1997; 1997, pp. 55; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

A Small Business Innovation Research (SBIR) contract to ITHACO, Inc. satisfied a Goddard Space Flight Center demand for a low cost altitude control system for small spacecraft. The SBIR-sponsored work resulted in the T-Wheel, built specifically for altitude control of small and medium-sized spacecraft. Another product, the T-SCANWHEEL, reduces overall system cost, minimizes mass and power and enhances reliability with a mixture of altitude control and control capacity. Additionally, the Type E Wheel is built for use on medium to large spacecraft. Through July 1996, ITHACO had delivered or was under contract for 95 T-Wheel, T-SCANWHEEL, and Type E Wheel units.
Author
Altitude Control; Attitude Control; Flight Altitude; Financial Management

20020076237 Swedish Defence Research Establishment, Stockholm, Sweden
Differential Geometrical Integration Algorithms ***Differentialgeometriska Integrationsalforitmer.***
Hamberg, J.; Lennartsson, A.; Jun. 2001; 32p; In Swedish
Report No.(s): PB2002-104961; FOI-R-0154-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the present status of the ongoing research in the field of differential geometric numerical methods done within the project Optimization of Missile Performance. These methods will plan an essential role in future guidance and simulation of missiles and missile systems, e.g. for strapdown navigation systems. Accurate numerical solution of the equations of motion is important for complicated motions or long simulation times. Most of the contents of the present report has already been described in the report FOA-R-00-10627-314-SE Optimization of missile performance: nonlinear system theory, chapter 6 of which constitutes a preliminary version of the present report.
NTIS
Missile Systems; Numerical Analysis; Algorithms; Optimization; Computerized Simulation

20020076440 ESDU International Ltd., London, UK
Loading on a rigid aeroplane in steady lateral manoeuvres
October 2001; In English; Available from ESDU International as part of the ESDU Series on Dynamics.
Report No.(s): ESDU 01010; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 01010 describes the loading characteristics of a rigid aeroplane during steady lateral maneuvers which include a steady horizontal turn, steady horizontal straight motion with an engine out and steady straight horizontal sideslipping flight. The overall symmetric (longitudinal) and antisymmetric (lateral) aerodynamic and inertial loads and moments on an aeroplane in a steady turning maneuver involving sideslip and bank are identified. The longitudinal and lateral equations of motion are formed and the conditions for independent longitudinal and lateral motion are established. The equilibrium equations to determine the longitudinal characteristics of wing-fuselage lift, tailplane lift, aeroplane angle of attack and elevator deflection are developed for cases when the longitudinal and lateral equations of motion are both independent and interdependent. The three steady lateral motions are identified as special cases of the general steady equations and it is shown how to determine the three lateral unknowns of aerodynamic sideforce on the fin, asymmetric rolling moment on the wing and angle of bank. Equations for the loading distributions, together with the bending moment and torque distributions, on the wing, tailplane, fin and fuselage are developed. ESDU-01010 complements two previously issued ESDU documents: ”Symmetric steady manoeuvre loads on rigid aircraft of classical configuration at subsonic speeds”, ESDU 94009, and ”Shear force, bending moment and torque of rigid aircraft in symmetric steady maneuvering flight”, ESDU 94045.
ESDU
Aircraft Maneuvers; Inertia; Rigid Structures; Load Distribution (Forces); Turning Flight; Aerodynamic Loads; Horizontal Flight

20020077951 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
Summary of Research on Reliability Criteria-Based Flight System Control ***Final Report, 1 Feb. 1999 - 31 Jan. 2002***
Wu, N. Eva, Binghamton Univ., USA; March 2002; 10p; In English
Contract(s)/Grant(s): NCC1-336; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper presents research on the reliability assessment of adaptive flight control systems. The topics include: 1) Overview of Project Focuses; 2) Reliability Analysis; and 3) Design for Reliability. This paper is presented in viewgraph form.
CASI
Adaptive Control; Flight Control; Reliability Analysis; Reliability Engineering; Control Systems Design

20020077954 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
A Decentralized Adaptive Approach to Fault Tolerant Flight Control
Wu, N. Eva, Binghamton Univ., USA; Nikulin, Vladimir, Binghamton Univ., USA; Heimes, Felix, Lockheed Martin Corp., USA; Shormin, Victor, Binghamton Univ., USA; [2000]; 6p; In English
Contract(s)/Grant(s): NCC1-336; NSF ECS-96-15956; RF-240-6687A; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper briefly reports some results of our study on the application of a decentralized adaptive control approach to a 6 DOF nonlinear aircraft model. The simulation results showed the potential of using this approach to achieve fault tolerant control. Based on this observation and some analysis, the paper proposes a multiple channel adaptive control scheme that makes use of the functionally redundant actuating and sensing capabilities in the model, and explains how to implement the scheme to tolerate actuator and sensor failures. The conditions, under which the scheme is applicable, are stated in the paper.
Author
Adaptive Control; Aircraft Models; Fault Tolerance; Flight Control; Nonlinearity; Mathematical Models

20020077957 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
Reliability Assessment of Reconfigurable Flight Control Systems Using Sure and Assist
Wu, N. Eva, Binghamton Univ., USA; [1992]; 14p; In English
Contract(s)/Grant(s): NCC1-336; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper presents a reliability assessment of Reconfigurable Flight Control Systems using Semi-Markov Unreliability Range Evaluator (SURE) and Abstract Semi-Markov Specification Interface to the SURE Tool (ASSIST).
CASI
Flight Control; Reliability Engineering; Control Systems Design; Mathematical Models

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).

20020074092 NASA Ames Research Center, Moffett Field, CA USA
Recent "Ground Testing" Experiences in the National Full-Scale Aerodynamics Complex
Zell, Peter, NASA Ames Research Center, USA; Stich, Phil, NASA Ames Research Center, USA; Sverdrup, Jacobs, NASA Ames Research Center, USA; [2002]; 1p; In English; 2002 Annual Meeting of the Subsonic Aerodynamic Testing Association (SATA), 9-15 Aug. 2002, Melbourne, Australia; No Copyright; Avail: Issuing Activity; Abstract Only

The large test sections of the National Full-scale Aerodynamics Complex (NFAC) wind tunnels provide ideal controlled wind environments to test ground-based objects and vehicles. Though this facility was designed and provisioned primarily for aeronautical testing requirements, several experiments have been designed to utilize existing model mount structures to support "non-flying" systems. This presentation will discuss some of the ground-based testing capabilities of the facility and provide examples of groundbased tests conducted in the facility to date. It will also address some future work envisioned and solicit input from the SATA membership on ways to improve the service that NASA makes available to customers.
Author
Ground Tests; Controlled Atmospheres; Support Systems; Wind Tunnels; Test Facilities

20020074808 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA

Coordination Between Airway Facilities Specialists and Air Traffic Personnel

Hah, Sehchang; Apr. 2002; 110p; In English

Report No.(s): AD-A404990; DOT/FAA/CT-TN02/07; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Airway Facilities (AF) is responsible for providing services and conducting operations that deliver the highest possible levels of National Airspace System (NAS) safety and efficiency. to accomplish this, AF specialists perform maintenance tasks for the NAS. This requires coordination between AF and various organizations including AT. Maintenance Control Center (MCC) specialists have been the focal point of coordination in AF, and AT supervisors are responsible for coordination in AT. AF specialists have been coordinating with AT successfully in the past. However, there has been no empirical research on this important coordination. This report presents the results of the empirical study on coordination. The Human Factors Group (ACB-220) surveyed MCC specialists and AT supervisors about their experience and opinions on coordination. Based on 95 AF and 179 AT respondents, we present recommendations for improving current coordination. The most critical recommendations are to facilitate mutual understanding between AF and AT and to redesign information-related aspects of coordination between them.

DTIC

Airports; Flying Personnel

20020074878 NCI Information Systems, Inc., Fairborn, OH USA

Aircraft Battle Damage Assessment and Repair (ABDAR). Volume 3: Field Test Report ***Final Report, Sep. 1995-Mar. 2000***

MacBeth, Scott; Jernigan, Johnnie; Grody, Jackie; Thomas, Donald L.; Clark, Michael E.; Jul. 2000; 71p; In English

Contract(s)/Grant(s): F41624-95-C-5003; Proj-2745

Report No.(s): AD-A405160; AFRL-HE-WP-TR-2002-0039; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This is the last of three volumes describing the results of a program to develop technology to enhance the aircraft battle damage assessment and repair (ABDAR) process. This volume describes the results of a field test conducted to evaluate the ABDAR Demonstration System. The system was evaluated by comparing the performances of technicians performing a simulated aircraft battle damage assessment task using the ABDAR demonstration system with the performances of technicians performing the task with conventional paper-based technical orders (TOs). The study compared two types of electronic technical data presented on the ABDAR Demonstration System (Content Data Model (CDM) and Indexed Portable Document Format (IPDFJ)) with the performance of technicians using paper TOs. Dependent variables of speed, accuracy, and completeness were measured. Subjects using the ABDAR Demonstration System with CDM data performed significantly faster than subjects using the ABDAR Demonstration System with IPDF data, improving the overall time by 86%. Subjects using CDM and IPDF data were significantly more accurate and complete than subjects using paper, regardless of technician type. Assessments by subjects using CDM were 39% more complete and 51% more accurate than assessments conducted by subjects using paper TOs. Assessments by subjects using IPDF were 34% more complete and 44% more accurate than assessments by subjects using paper TOs. Overall, the ABDAR Demonstration System tools, in conjunction with electronic technical data, provided a significant advantage over the current, paper-based method of performing ABDAR assessments.

DTIC

Military Aircraft; Aircraft Maintenance; Damage Assessment

20020075045 NCI Information Systems, Inc., Fairborn, OH USA

Aircraft Battle Damage Assessment and Repair (ABDAR). Volume 1: Executive Summary ***Final Report, Sep. 1995-Mar. 2000***

Dierker, Ron; Botello, Charlie; MacBeth, Scott; Grody, Jackie; Thomas, Donald L.; Jul. 2000; 24p; In English

Contract(s)/Grant(s): F41624-95-C-5003; Proj-2745

Report No.(s): AD-A405164; AFRL-HE-WP-TR-2002-0039; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is the first of three volumes describing the results of a program to develop technology to enhance the Aircraft Battle Damage Assessment and Repair (ABDAR) process. This volume provides an executive summary and describes the overall program goals, the methodology used to develop the ABDAR technology and a demonstration system, and the results of a field test conducted to evaluate the effectiveness of the ABDAR technology and its benefits. The approach adopted was to develop an automated capability to provide aircraft battle damage assessors with technical data and assessment tools via a portable maintenance aid. A demonstration system was developed and used to evaluate the ABDAR concept. The ABDAR Demonstration System developed was an end-to-end system. It started with the aircraft debrief and continued through the ABDAR process to final documentation of the damage assessment on an Air Force Technical Order (AFTO) Form 97. The demonstration system provided the assessor with technical data for the testbed aircraft (F-15A), including applicable aircraft battle damage repair

manuals and Technical Order (TO) 1-1H-39, Technical Manual General Aircraft Battle Damage Repair. The system supports two types of Electronic Technical Information (ETI). The first type of data, in the Indexed Portable Document Format (IPDF), presents technical data electronically in a format very similar to the paper TO. The second type of ETI, in the Content Data Model (CDM) format, provides technical data in an interactive mode. Sample technical data was developed in both formats. The field test results demonstrated that the use of the ABDAR system significantly improves the speed, accuracy and completeness of assessments. DTIC

Computer Programs; Military Aircraft; Aircraft Maintenance; Damage Assessment; Fault Detection; End-to-End Data Systems; Systems Health Monitoring

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.

20020074662 NASA Johnson Space Center, Houston, TX USA

New Approaches for Exploration Beyond Low Earth Orbit

Cooke, D. R., NASA Johnson Space Center, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 9; In English; Also announced as 20020074653; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Through the work of the NASA Exploration Team (NEXT), innovations in mission architectures have been developed. Missions beyond low Earth orbit have been dramatically simplified through new combinations in the application of advanced technologies and mission design. These concepts enable a stepping stone approach to discovery driven, technology enabled exploration. The architectures have evolved from the interest in easily reaching the poles of the moon, to take advantage of the water ice that is believed to exist in the permanently dark craters. The Polar Regions also have areas that are consistently sunlit, providing a constant source of power. by staging these missions from the Earth-Moon Lagrange point, L1, other sites on the lunar surface can be reached as easily as the polar sites. Through studying this approach to lunar exploration, and combining new trajectory approaches the staging of other missions from L1 has begun to look attractive. The possibilities of missions include the assembly and maintenance of arrays of telescopes for emplacement at the Earth-Sun L2, and travel to Mars. The resulting numbers and masses of vehicles required are greatly reduced. Vehicle design concepts are developed for proof of concept, to validate mission approaches and understand the value of new technologies. The stepping stone approach employs an incremental buildup of capabilities; allowing for decision points on exploration objectives. It enables testing of technologies to achieve greater reliability and understanding of costs for the next steps in exploration.

Author

Lunar Exploration; Lunar Surface; Mission Planning

20020074696 Defense Advanced Research Projects Agency, Arlington, VA USA

DOD Technologies and Capabilities of Relevance to Future Lunar Science and Exploration Objectives

Nozette, S., Defense Advanced Research Projects Agency, USA; Worden, S. P., Air Force Space Command, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 43; In English; Also announced as 20020074653; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Currently several Department of Defense (DoD) Organizations are exploring new technologies which may be applied to future lunar science and exploration objectives. DoD launch vehicle programs currently reaching initial operational capability (e.g. Evolved Expendable Launch Vehicle (EELV)), and future programs under study, can provide new capabilities for future lunar programs. These include the development of the EELV Secondary Payload Adapter (ESPA) which could allow low cost launch of capable (200 kg, 2 km per sec) microsatellites to Geosynchronous Transfer Orbit (GTO) or beyond. A suite of DoD developed microsatellite technologies with significant performance and reduced cost will also reach maturity in the next several years. These systems will provide comparable performance and a factor of 2 reductions in cost and mass from Clementine, developed earlier in the previous decade. Future lunar science and exploration objectives enabled by these capabilities include: astrodynamics operational verification, resource surveys, improved topographic, illumination and gravity mapping, low cost infrastructure for

landers such as navigation, communications, and surface infrastructure required for future robotic and human missions. Several design concepts currently under investigation will be presented.
Author
Mission Planning; Defense Program; Launch Vehicles; Lunar Exploration; Microsatellites

13
ASTRODYNAMICS

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

20020074795 Washington Univ., Dept. of Aeronautics and Astronautics, Seattle, WA USA
Exhaust Plume Characterization of a Mini-PPT Using a Time-of-Flight/Gridded Energy Analyzer
Burton, Travis A.; Jan. 2002; 103p; In English; Original contains color images
Report No.(s): AD-A404972; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Despite first seeing operational use aboard spacecraft nearly forty years ago, electric propulsion (EP) systems have only gained widespread acceptance over the past decade. Long recognized for the higher specific impulse and lower system mass fraction they offer over chemical propulsion systems; EP systems stayed largely unproven during the early days of the space age because the spacecraft power systems they require had not yet been developed. The maturation of the EP field in recent years has been due to both the gradual development of adequate spacecraft power systems and the increased focus on high performance, low weight spacecraft components by the spacecraft engineering community. Today a variety of EP devices are employed across nearly the entire spectrum of spacecraft missions.
DTIC
Electric Propulsion; Spacecraft Equipment

14
GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and test chambers and simulators. Also includes extraterrestrial bases and supporting equipment. For related information see also 09 Research and Support Facilities (Air).

20020075578 Boeing Co., Rocketdyne Propulsion and Power, Canoga Park, CA USA
Development and Application of TCAT - Thrust Chamber Assembly Analysis Toolkit
Farhangi, S., Boeing Co., USA; Huang, Y., Boeing Co., USA; Darian, A., Boeing Co., USA; Paris, J., Boeing Co., USA; Beck, J., Boeing Co., USA; Lynch, E., Boeing Co., USA; Jensen, R. J., Boeing Co., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 363-372; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

There are many individual computational tools and methods used to analyze and design components of a rocket engine Thrust Chamber Assembly (TCA). In the analysis process these tools are usually applied in sequence while the communication of information between these tools is typically accomplished manually. The objective of the current software development effort is to select, integrate and automate the best tools into an easy-to-use computational package, the Thrust Chamber Analysis Toolkit, or TCAT. This toolkit provides a seamless process to analyze and design all or individual components of a TCA. This paper describes the status and recent achievements of the MAT software development effort. User and module interfaces and module integration status are discussed. The selected models/codes and their capabilities are briefly described. Recently added Pre- and Post-processing options are presented and overall toolkit capabilities are demonstrated with the results of sample cases. Ongoing and planned model validation efforts are also described. Finally, future development options are discussed.
Author
Software Development Tools; Thrust Chambers; Rocket Engines

20020076243 Femtometrics, Inc., Irvine, CA USA
Cleanroom Contaminant Monitor
Spinoff 1997; 1997, pp. 119; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under a Small Business Innovation Research (SBIR) contract from Kennedy Space Center (KSC), Femtometrics, Inc. developed the Real-Time Non-Volatile Residue (NVR) monitor. Criteria established by KSC called for a technology that could regulate the accumulation of nonvolatile residues in cleanroom environments. The company accommodated the Center's need with an advanced, highly sensitive surface acoustic wave (SAW) microsensor capable of detecting sub-monolayer deposition in cleanrooms where aerospace systems are assembled. Years earlier, Femtometrics responded to and received SBIR contracts from Langley Research Center for highly sensitive aerosol detectors for environmental researchers. Stimulated by the SBIR wins, the company set about to develop the SAW resonator technology. A new type of sensor has evolved from the research, one that has the ability to measure a range of chemical vapors by applying chemical-specific coating on the sensing surface. Commercial applications of the Real-Time NVR include Class 1 cleanrooms at semiconductor and hard-disk manufacturing plants.
Author
Real Time Operation; Residues; Volatile Organic Compounds; Clean Rooms; Aerosols; Microinstrumentation

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.

20020074562 Air Force Research Lab., Edwards AFB, CA USA
On-Orbit Observations of the ESEX 26 kW Ammonia Arcjet
Johnson, L. K.; Spanjers, G. G.; Bromaghim, D. R.; LeDue, J. R.; Salasovich, R. M.; Jun. 1999; 8p; In English
Report No.(s): AD-A404932; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A 30 kW ammonia arcjet aboard an Air Force research spacecraft operated successfully. During the course of eight arcjet firings in March and April, 1999, optical observations from on-board and ground-based sensors were obtained. Images from the on-board still camera indicate that the nozzle temperature distribution is consistent with arcjet heating models and ground observations. Images of the thruster plume at 656 nm confirm predictions that the luminescent plume in the space environment is more diffuse and compact than the plume from a thruster operated in the laboratory at higher background pressure. Finally. observations using a ground-based telescope reveal a mixed greybody/line emission spectrum over the range 325-675 nm. The spectral features and line ratios are similar to those observed in ground-based measurements.
DTIC
Spacecraft Propulsion; Systems Health Monitoring; Optical Measuring Instruments; Arc Jet Engines; Rocket Nozzles

20020075041 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Model Predictive Control for Ascent Load Management of a Reusable Launch Vehicle
Martin, Andrew A.; Jun. 2002; 190p; In English
Report No.(s): AD-A405083; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

During the boost phase of ascent, winds have a significant impact on a launch vehicle's angle of attack, and can induce large structural loads on the vehicle. Traditional methods for mitigating these loads involve measuring the winds prior to launch and designing trajectories to minimize the vehicle angle of attack (0). The current balloon-based method of collecting wind field information produces wind profiles with significant uncertainty due to the inherent time delays associated with balloon measurement procedures. Managing the mission risk caused by these uncertain wind measurements has always been important to control system designers. This thesis will describe a novel approach to managing structural loads through the combination of a Light Detection and Ranging (LIDAR) wind sensor, and Model Predictive Control (MPC). LIDAR wind sensors can provide near real-time wind measurements, significantly reducing wind uncertainty at launch. MPC takes full advantage of this current wind information through a unique combination of proactive control, constraint integration and tuning flexibility. This thesis describes the development of two types of MPC controllers, as well as a baseline controller representative of current control methods used by industry. A complete description of Model Predictive Control theory and derivation of the necessary control matrices is included. The performance of each MPC controller is compared to that of the baseline controller for a wide range of wind profiles from both the Eastern and Western U.S. Test Ranges. Both MPC controllers are shown to provide reductions of greater than 50% in 0, Qo and structural bending moments. In addition, the effects of wind measurement delays and uncertainty on the performance of each controller are investigated.
DTIC
Ascent; Control Theory; Loads (Forces); Predictions; Reusable Launch Vehicles; Wind (Meteorology)

20020076018 NASA Langley Research Center, Hampton, VA USA

Static Longitudinal Stability and Control Characteristics At A Mach Number of 1.99 of a Lenticular-Shaped Reentry Vehicle

Jackson, Charles M., Jr., NASA Langley Research Center, USA; Harris, Roy V., Jr., NASA Langley Research Center, USA; October 1960; 17p; In English

Report No.(s): NASA-TN-D-514; L-1018; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An investigation has been made in the Langley 4- by 4-foot supersonic pressure tunnel at a Mach number of 1.99 to determine the longitudinal stability and control characteristics of a reentry model consisting of a lenticular-shaped body with two fin configurations (horizontal fins with end plates). Effects of deflecting the larger size fins as pitch-control surfaces were also investigated. The results indicate that the body alone was unstable from an angle of attack of 0 deg to about 55 deg where it became stable and remained so to 90 deg. The addition of fins provided positive longitudinal stability throughout the angle-of-attack range and increased the lift-drag ratio of the configuration. Reducing the horizontal-fin area at the inboard trailing edge of the fin had only a small effect on the aerodynamic characteristics of the vehicle for the condition of no fin deflection. Deflecting the fins, appeared to be an effective means of pitch control and had only a small effect on lift-drag ratio.

Author

Static Stability; Control Surfaces; Aerodynamic Characteristics; Longitudinal Stability; Lenticular Bodies; Lift Drag Ratio

20020077952 NASA Langley Research Center, Hampton, VA USA

A Procedure for Structural Weight Estimation of Single Stage to Orbit Launch Vehicles (Interim User's Manual)

Martinovic, Zoran N., NASA Langley Research Center, USA; Cerro, Jeffrey A., NASA Langley Research Center, USA; September 2002; 59p; In English

Contract(s)/Grant(s): RTOP 706-88-21-03

Report No.(s): NASA/TM-2002-211931; L-18169; NAS 1.15:211931; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This is an interim user's manual for current procedures used in the Vehicle Analysis Branch at NASA Langley Research Center, Hampton, Virginia, for launch vehicle structural subsystem weight estimation based on finite element modeling and structural analysis. The process is intended to complement traditional methods of conceptual and early preliminary structural design such as the application of empirical weight estimation or application of classical engineering design equations and criteria on one dimensional "line" models. Functions of two commercially available software codes are coupled together. Vehicle modeling and analysis are done using SDRC/I-DEAS, and structural sizing is performed with the Collier Research Corp. HyperSizer program.

Author

Structural Weight; Single Stage to Orbit Vehicles; Mathematical Models; User Manuals (Computer Programs); Launch Vehicles

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.

20020075586 NASA Marshall Space Flight Center, Huntsville, AL USA

Technology Assessments within NASA's Integrated Technology Assessment Center

Taylor, J. L., NASA Marshall Space Flight Center, USA; Neely, M. A., NASA Marshall Space Flight Center, USA; Curran, F. M., Science Applications International Corp., USA; Christensen, E. R., Science Applications International Corp., USA; Escher, D., Science Applications International Corp., USA; Lovell, N., Science Applications International Corp., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 441-448; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

NASA's Advanced Space Transportation Program (ASTP) founded the Integrated Technology Assessment Center (ITAC) to provide a comprehensive, systematic approach to identify long-term technology needs, to quantify payoffs for technology investments, and to assess the progress of ASTP-sponsored technology programs in the hypersonics/Earth-to-orbit area. to accomplish these goals, the ITAC has assembled an experienced team representing a broad sector of the aerospace community and developed a systematic assessment process complete with supporting tools. In the ITAC approach, concepts for transportation systems are first selected based on relevance to the ASTP. Models of these concepts are then developed and data on advanced

technologies are collected. Projections of key technology characteristics with respect to the specific concepts of interest are made. Both the models and technology projections are then fed into the ITAC's probabilistic systems analysis framework. The probabilistic outputs are weighed against metrics of interest to ASTP and a multivariate decision making process is used to provide inputs for technology prioritization within the ASTP. At present, the ITAC program is working to evaluate a variety of technologies for three two-stage hypersonic vehicle concepts. Concepts include an all rocket, vertical take off-horizontal landing (VTHL) system, a horizontal takeoff-horizontal landing (HTHL) RBCC-propelled first stage/all rocket second stage system, and an HTHL turbine-based first stage/all rocket second stage system. This paper will provide a status update of the ITAC program including current results and plans.
Author
Technology Assessment; Decision Making; Landing Aids; Multivariate Statistical Analysis; Takeoff

20020077966 NASA Ames Research Center, Moffett Field, CA USA
Aerocapture Technology Development Needs for Outer Planet Exploration
Wercinski, Paul, NASA Ames Research Center, USA; Munk, Michelle, NASA Langley Research Center, USA; Powell, Richard, NASA Langley Research Center, USA; Hall, Jeff, Jet Propulsion Lab., California Inst. of Tech., USA; Graves, Claude, NASA Johnson Space Center, USA; January 2002; 22p; In English
Contract(s)/Grant(s): RTOP 713-81-80
Report No.(s): NASA/TM-2002-211386; NAS 1.15:211386; A-0107378; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this white paper is to identify aerocapture technology and system level development needs to enable NASA future mission planning to support Outer Planet Exploration. Aerocapture is a flight maneuver that takes place at very high speeds within a planet's atmosphere that provides a change in velocity using aerodynamic forces (in contrast to propulsive thrust) for orbit insertion. Aerocapture is very much a system level technology where individual disciplines such as system analysis and integrated vehicle design, aerodynamics, aerothermal environments, thermal protection systems (TPS), guidance, navigation and control (GN&C) instrumentation need to be integrated and optimized to meet mission specific requirements. This paper identifies on-going activities, their relevance and potential benefit to outer planet aerocapture that include New Millennium ST7 Aerocapture concept definition study, Mars Exploration Program aeroassist project level support, and FY01 Aeroassist In-Space Guideline tasks. The challenges of performing aerocapture for outer planet missions such as Titan Explorer or Neptune Orbiter require investments to advance the technology readiness of the aerocapture technology disciplines for the unique application of outer planet aerocapture. This white paper will identify critical technology gaps (with emphasis on aeroshell concepts) and strategies for advancement.
Author
Aerocapture; Aerothermodynamics; Spacecraft Design; Orbit Insertion; Spacecraft Maneuvers; Outer Planets Explorers

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.

20020076218 Avtec Systems, Inc., Fairfax, VA USA
Telemetry Technology
Spinoff 1997; 1997, pp. 108-109; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

In 1990, Avtec Systems, Inc. developed its first telemetry boards for Goddard Space Flight Center. Avtec products now include PC/AT, PCI and VME-based high speed I/O boards and turn-key systems. The most recent and most successful technology transfer from NASA to Avtec is the Programmable Telemetry Processor (PTP), a personal computer- based, multi-channel telemetry front-end processing system originally developed to support the NASA communication (NASCOM) network. The PTP performs data acquisition, real-time network transfer, and store and forward operations. There are over 100 PTP systems located in NASA facilities and throughout the world.
Author
Telemetry; Data Acquisition; Data Collection Platforms

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.

20020076097 Integral Systems, Inc., Lanham, MD USA
Managing Satellites
Spinoff 1997; 1997, pp. 102; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Integral Systems, Inc.'s EPOCH 2000 forms the core of NASA's Near Earth Asteroid Rendezvous (NEAR) mission's command and control center. EPOCH 2000, which allows ground operators to monitor and control satellites over a wide area network, owes part of its heritage from work completed to support Goddard Space Flight Center. The software automates telemetry processing, commanding, anomaly detection, and archiving collected data. The NEAR spacecraft, launched in February 1996, will rendezvous in early 1999 and orbit the Asteroid Eros for a year. Integral Systems also provided Low Earth Orbit Autonomous Ground Terminals (LEO-Ts) to NASA. The LEO-T is designed to make it easier and less expensive for principal investigators to obtain telemetry, tracking and control services for their science missions. The company products have supported well over 70 satellite missions aimed at scientific research, meteorology, or communications applications.
Author
Satellite Communication; Meteorology; Telemetry; Anomalies

20020076340 National Defence Research Establishment, Div. of Defence Analysis, Stockholm, Sweden
Future Satellite Reconnaissance Systems ***Framtida System foer Spaning Fran Satellit***
Ekblad, U.; Mar. 2000; 70p; In Swedish
Report No.(s): PB2002-107195; FOA-R-00-01463-201-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The report, which is the result of the work from one of the working groups of LUST, describes the capabilities of reconnaissance satellites, what support can be obtained from reconnaissance satellites in the future and the possibilities of procuring Swedish military reconnaissance satellites. In the report some new ideas on reconnaissance systems and methods which ought to be possible to realize before the year 2020 are presented. Satellite reconnaissance is better suited for strategic reconnaissance than for tactical reconnaissance and for international operations can reconnaissance data from satellites give very valuable information, which can not be obtained from other reconnaissance sources. How reconnaissance satellites best are used depends, however, on several factors. Optical reconnaissance, radar reconnaissance and SIGINT are because of their different characters difficult to compare. There is no standpoint taken in question on whether Sweden ought to procure its own military satellite reconnaissance capability, and in that case what type of reconnaissance sensors that should be used since it is up to the user of reconnaissance data to decide on these matters. However, interesting satellite concepts emerged which are judged to be worthy of more profound studies. These are laser reconnaissance satellite, GEO satellites for COMINT, clusters of satellites in LEO for geolocalization of emitters and satellites for multistatic radar concepts.
NTIS
Reconnaissance Spacecraft; Armed Forces (Foreign); Procurement; Swedish Space Program

19
SPACECRAFT INSTRUMENTATION AND ASTRIONICS

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

20020076353 Stockholm Univ., Arrhenius Lab, Sweden
Studies for the Odin Sub-Millimeter Radiometer (A Three Part Study)
Merino, F.; Eriksson, P.; Baron, P.; Murtagh, D. P.; Ridal, M.; Nov. 2000; 78p; In English
Report No.(s): PB2002-105903; REPT-AP-36; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This study is devoted to the aeronomy mission of the sub millimeter (SMR) instrument on board the Swedish satellite Odin. It is a three part series describing the data processing of SMR calibrated measurements to geophysical parameters. Part I addresses the modeling of atmospheric radiative transfer and the effect of instrumental properties through a forward model. Part II presents the inversion methodology developed to retrieve atmospheric vertical profiles of trace gases. Part III describes the choices of observing modes and the expected performance of the SMR instrument.
NTIS
Radiometers; Aeronomy; Millimeter Waves; Radiative Transfer

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.

20020074560 Air Force Research Lab., Edwards AFB, CA USA
KLIN Cycle Engine - Deeply Cooled Turbojet (DCTJ) Engine Performance Formulation
Jul. 10, 2000; 22p; In English
Report No.(s): AD-A404927; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Predicted performance and features of a combined propulsion concept for a small reusable launch vehicle known as KLIN cycle are discussed. The KLIN cycle consists of a thermally integrated deeply cooled turbojet and a liquid rocket engine. The objective of this concept is to achieve a highpressure ratio in a simple, lightweight turbojet engine. The proven result is an exceptional engine thrust-to-weight ratio, as well as improved specific impulse and mass fraction of the launcher. When based on the RL10 engine family, the KLIN cycle makes a small single-stage-to-orbit and two-stage-to-orbit reusable launch vehicles feasible and very economically attractive.
DTIC
Liquid Propellant Rocket Engines; Turbojet Engines

20020074565 Air Force Research Lab., Edwards AFB, CA USA
In-Flight Contamination Measurements of the ESEX 26 kW Ammonia Arcjet
Spanjers, G.G.; Schilling, J.H.; Engelman, S.F.; Bromaghim, D.B.; Johnson, L.K.; Jun. 1999; 20p; In English; Prepared in collaboration with The Aerospace Corp., El Segundo, CA
Report No.(s): AD-A404912; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USA Air Force Research Laboratory's Electric Propulsion Space Experiment (ESEX) was launched and operated in early 1999 in order to demonstrate the compatibility and readiness of a 30-kW class ammonia arcjet for satellite propulsion applications. As part of this flight, an array of on-board contamination sensors was used to assess the effect of the arcjet on the spacecraft surfaces and environment. The contamination sensors have also been used to assess the spacecraft outgassing and to provide information during in-flight anomalies. The sensors consisted of microbalances to measure material deposition, radiometers to assess material degradation due to thermal irradiation, and solar cell segments to quantify the potential for solar array degradation. No material deposition is observed during six arcjet firings, with the exception of the first firing. Deposition during the first firing is observed only on the microbalance near the arcjet exit, and is attributed to the expulsion of foreign material within the arcjet that presumably accumulated during the fabrication, integration, and storage of the device prior to launch. Solar cell degradation is observed during the firings and is attributed to the exhaust plasma forming slightly conductive paths away from the cell load. Once the firing ends, the solar cell returns to full operation with no observable degradation. Initial evaluation of the radiometer data suggests some material degradation of the 513-GLO coating, however a more detailed transient analysis is required for a conclusive result. Flight data is continuing to be collected on all contamination sensors to further quantify changes to the spacecraft atmosphere due to operation of the other 8 experiments aboard the ARGOS spacecraft.
DTIC
Electric Propulsion; Electrojets; Detectors; Contamination

20020074576 Air Force Research Lab., Edwards AFB, CA USA

Solar Cell Degradation During the 26kW Electric Propulsion Space Experiment (ESEX) Flight

Schilling, J. H.; Spanjers, G. G.; Bromaghim, D. R.; Jan. 11, 2001; 17p; In English; Prepared in collaboration with The Aerospace Corp., El Segundo, CA

Report No.(s): AD-A404891; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The USA Air Force Research Laboratory's Electric Propulsion Space Experiment (ESEX) was launched and operated in early 1999 in order to demonstrate the compatibility and readiness of a 30-kW class ammonia arcjet for satellite propulsion applications. As part of this flight, an array of on-board contamination sensors was used to assess the effect of the arcjet and other environments on the spacecraft. The sensors consisted of microbalances to measure material deposition, radiometers to assess material degradation due to thermal radiation, and solar cell segments to investigate solar array degradation. During firings, the solar cell segments show decreasing open-circuit voltage probably attributable to an additional electrical load provided by a short through the plume plasma. Over eight firings of the ESEX arcjet, and 33 minutes, 26 seconds operating time, the solar cells also exhibit a 3% decrease in short-circuit current, attributable to decreased solar transmission of the cover glass. However, no effects associated with the arcjet are observed on the spacecraft solar arrays. In general, the contamination effects are observed only on the solar cells sensor segments placed very near the thruster exhaust nozzle. In the backplane of the thruster, where the main arrays are located, no deleterious effects are observed, indicating that while engineering measures may be required for equipment in the immediate vicinity of the thruster, the arcjet environment is generally benign.

DTIC

Electric Propulsion; Spaceborne Experiments; Solar Cells; Artificial Satellites; Space Flight

20020074813 Air Force Research Lab., Edwards AFB, CA USA

Smart Structures for Rocket Propulsion Systems

Shelley, J. S.; Sep. 2000; 9p; In English

Report No.(s): AD-A405016; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Solid and liquid propellant rocket propulsion systems are weight- and performance- driven machines whose components experience extreme environments. However, the structural integrity of both types of propulsion systems is currently monitored through type testing, labor-intensive x-ray analysis, and other NDE (non-destructive evaluation) techniques. Smart structures technologies have the potential not only to alleviate some of the maintenance burden of current rocket propulsion systems but also improve the capability of future systems. This paper discusses the rocket design parameters and operational environments driving the application of passive structural health monitoring systems to both liquid propellant engines, with complex rotating machinery and severe thermal environments, and solid rocket motors, with long required silo lives of highly filled, chemically active, viscoelastic propellant. The potential for application of active smart structures technology to rocket systems will also be discussed including the control of solid propellant to permit throttling of solid motors and control of thermal shrinkage, vibration suppression, and improved creep resistance of rotating components and subassemblies for liquid rocket engines. While the rocket manufacturers are not currently developing smart structures technology for propulsion applications, the potential improvements in increased systems reliability, longer operational lifetimes, reduced weight, increased capability drive the need for research in this area.

DTIC

Rocket Propellants; Liquid Propellant Rocket Engines; Solid Propellant Rocket Engines; Structural Stability; Smart Structures

20020074827 Air Force Research Lab., Edwards AFB, CA USA

AFRL Propulsion Directorate Briefing for Industry (PRS Input)

Jul. 10, 1998; 13p; In English

Report No.(s): AD-A404867; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

These viewgraphs present a AFRL Propulsion Directorate briefing for industry.

DTIC

Research; Propulsion; Navy; Rocket Thrust

20020074828 Air Force Research Lab., Edwards AFB, CA USA

Sea Water Immersion of Gem II Propellant

Merrill, C. I.; O'Drobinak, J. D.; Mar. 23, 1998; 8p; In English

Report No.(s): AD-A404866; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Following the Delta II flight failure on 17 Jan 97, the question of continuing safety for solid propellant that had fallen into the Atlantic ocean arose. With this failure, approximately 200,000 pounds of HTPB solid propellant were released. While large

amounts of propellant were consumed in burning fragments and ground impact explosions, considerable amounts of unburned propellant fell onto the land and into the Atlantic ocean. It was quickly found that propellant attacked by sea water became mushy, and ammonium perchlorate (AP) crystallized on propellant surfaces if it was allowed to dry. Concerns were raised that propellant washing ashore might present fire and/or explosive hazards. In response to these concerns, a program was initiated to investigate the effects of sea water on GEM II propellant as a function of time and its activity when burned, impacted, or subjected to friction. to date, results show that AP is leached out of the propellant at a straight line rate on a logarithmic plot. Friction and impact data on dried, sea water soaked propellant samples show no significant differences from virgin propellant. With wet sea water aged propellant samples, outer surface layers were found to be significantly less sensitive (friction and impact) than virgin propellant. The centers of these samples were found to be less sensitive than virgin propellant, but definitely more sensitive than their wet outer skin. In fuel Fires, no difference was observed between virgin propellant and dried, sea water aged propellant burning. These samples ignited immediately with burning over all exposed surfaces. In contrast, wet sea water aged samples all had experienced ignition delays. Ignition delay usually paralleled propellant sample time of water exposure. In addition, these samples only burned from one face.
DTIC
Sea Water; HTPB Propellants; Safety; Water Immersion

20020074834 Air Force Research Lab., Edwards AFB, CA USA
Propulsion and Energy: Solid Rockets
Aug. 30, 2001; 6p; In English
Report No.(s): AD-A404865; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
On November 16th, 2000 the culmination of an aggressive 23 month, jointly funded Integrated High-Payoff Rocket Propulsion Technology (IHPRPT) Phase I missile Propulsion program by the Air Force Research Laboratory Propulsion Directorate and Alliant Techsystems resulted in a highly successful full-scale rocket motor demonstration. This motor contained the most new technology on any one demonstration since the Trident I (C4) 25 years ago. The full-scale test incorporated new case, propellant, nozzle, and control technologies in a 92 inch diameter, 120,000 pound class motor, and verified achievement of the Phase I program specific impulse, mass fraction, and cost goals. The technologies that were demonstrated have the potential to yield a 23% increase in payload capability at a 32 % lower cost for solid booster space lift applications are ready for transition into strategic missiles, small and large launch vehicles as stages or strap-on boosters. The IHPRPT Phase I Missile Propulsion demonstration is the first in a series of tests that are part of a three phased, government and industry coordinated effort that began in 1996 with the vision to double the propulsion capability by 2010. The Phase II programs, awarded during the past year, are part of the government/industry Technology for the Sustainment of Strategic Systems (TSSS) effort to maintain critical technology capability.
DTIC
Solid Rocket Propellants; Propulsion; Technology Utilization; Full Scale Tests; Chemical Energy

20020074892 Air Force Research Lab., Edwards AFB, CA USA
AFRL Missile Propulsion Technology
Shertzer, Amy; Jul. 19, 2002; 5p; In English
Report No.(s): AD-A405107; AFRL-PR-ED-VG-2002-194; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
Material for Maj. Gen. Nielsen's missile technology presentation at the 5th annual Space and Missile Defense Conference in Huntsville, AL, 21 August 2002.
DTIC
Research; Missile Defense; Propulsion

20020074894 Johns Hopkins Univ., Chemical Propulsion Information Agency, Columbia, MD USA
2ND JANNAF Modeling & Simulation Subcommittee Meeting. Volume I
Apr. 2002; 332p; In English
Contract(s)/Grant(s): SP0700-97-D-4004
Report No.(s): AD-A405110; CPIA-PUB-715-VOL-1; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche
This volume, the first of two volumes, is a collection of 26 unclassified/ unlimited-distribution papers which were presented at the Joint Army-Navy-NASA-Air Force (JANNAF) 2nd Modeling and Simulation Subcommittee (MSS) held jointly with the 38th Combustion Subcommittee (CS), 26th Airbreathing Propulsion Subcommittee (APS), and 20th Propulsion Systems Hazards Subcommittee (PSHS). The meeting was held 8-12 April 2002 at the Bayside Inn at The Sandestin Golf & Beach Resort and Eglin Air Force Base, Destin, Florida. Topics covered include: uncertainty assessment and management, virtual engineering, integrated

vehicle health management (IVHM) intelligent systems, IVHM propulsion, and modeling and simulation of components, complex hydrocarbon fuels and unsteady processes and liquid propulsion combustion systems.
DTIC
Mathematical Models; Air Breathing Engines; Combustion Chambers

20020074897 Johns Hopkins Univ., Chemical Propulsion Information Agency, Columbia, MD USA
38TH JANNAF Combustion Subcommittee Meeting. Volume I
Fry, Ronald S.; Eggleston, Debra S.; Gannaway, Mary T.; Apr. 2002; 658p; In English
Contract(s)/Grant(s): SP0700-97-D-4004
Report No.(s): AD-A405114; CPIA-PUB-712-VOL-1; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

This volume, the first of two volumes, is a collection of 55 unclassified/ unlimited-distribution papers which were presented at the Joint Army-Navy-NASA-Air Force (JANNAF) 38th Combustion Subcommittee (CS), 26th Airbreathing Propulsion Subcommittee (APS), 20th Propulsion Systems Hazards Subcommittee (PSHS), and 2nd Modeling and Simulation Subcommittee. The meeting was held 8-1 2 April 2002 at the Bayside Inn at The Sandestin Golf & Beach Resort and Eglin Air Force Base, Destin, Florida. Topics cover five major technology areas including: 1) Combustion - Propellant Combustion, Ingredient Kinetics, Metal Combustion, Decomposition Processes and Material Characterization, Rocket Motor Combustion, and Liquid & Hybrid Combustion; 2) Liquid Rocket Engines - Low Cost Hydrocarbon Liquid Rocket Engines, Liquid Propulsion Turbines, Liquid Propulsion Pumps, and Staged Combustion Injector Technology; 3) Modeling & Simulation - Development of Multi-Disciplinary RBCC Modeling, Gun Modeling, and Computational Modeling for Liquid Propellant Combustion; 4) Guns - Gun Propelling Charge Design, and ETC gun Propulsion; and 5) Airbreathing - Scramjet and Ramjet S&T Pro ram Overviews.
DTIC
Mathematical Models; Air Breathing Engines; Combustion Chambers

20020075043 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Mission and Micronozzle Flow Analysis of a High-Temperature Chemical Micropropulsion System
Jones, Jessy R.; Aug. 14, 2002; 276p; In English
Report No.(s): AD-A405088; AFIT-CI02-121; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Recent trends in small-scale satellites motivate the further development of the propulsion subsystem. Micro-electromechanical systems (MEMS) micronozzles provide sufficient geometries to produce impulse bits suitable for this scale of satellite. An area of concern with MEMS micronozzles is the inefficiency associated with viscous losses of the developing boundary layer. The University of Washington recently commenced research on a high temperature propulsion system. An advantage of increased temperature levels is an increase in specific impulse. A disadvantage is an increase in Viscous effects. The present research focuses on using numerical methods to determine an area of diminishing return for increased chamber temperature conditions. initial focus is on the development of an optimum geometry which can be applied to these high-temperature gases. Using past research efforts, an expansion half angle of 30 degrees and expansion ratio of 10 are chosen. An interesting trend of the Reynolds number is observed for small to large aspect ratios. to determine optimum thrust and specific impulse efficiency, the aspect ratio is varied from 1, 5, 10, to 15. It is found that aspect ratios of 5, 10, and 15 for the same thrust level produce better results than an aspect ratio of 1. Using an aspect ratio of 10, a temperature analysis of Reynolds numbers is analyzed for chamber temperatures of 1000 to 3000 K. Although the viscous effects increase with the increase in temperature, the author proves that up to 3000 K, there is not an area of diminishing return for any of the aspect ratios in question. These results are applied to various missions for both the main and attitude- control propulsion subsystems.
DTIC
High Temperature; Low Thrust Propulsion; Microelectromechanical Systems; Spacecraft Propulsion; Nozzle Flow

20020075590 Pennsylvania State Univ., Propulsion Engineering Research Center, University Park, PA USA
Design and Study of a LOX/GH2 Throttleable Swirl Injector for Rocket Applications
Greene, Christopher, Pennsylvania State Univ., USA; Woodward, Roger, Pennsylvania State Univ., USA; Pal, Sibtosh, Pennsylvania State Univ., USA; Santoro, Robert, Pennsylvania State Univ., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 479-492; In English; Also announced as 20020075551
Contract(s)/Grant(s): NAG8-1732; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A LOX/GH2 swirl injector was designed for a 10:1 propellant throttling range. to accomplish this, a dual LOX manifold was used feeding a single common vortex chamber of the swirl element. Hot-fire experiments were conducted for rocket chamber pressures from 80 to 800 psia at a mixture ratio of nominally 6.0 using steady flow, single-point-per-firing cases as well as dynamic

throttling conditions. Low frequency (mean) and high frequency (fluctuating) pressure transducer data, flow meter measurements, and Raman spectroscopy images for mixing information were obtained. The injector design, experimental setup, low frequency pressure data, and injector performance analysis are presented. C* efficiency was very high (approx. 100%) at the middle of the throttleable range with somewhat lower performance at the high and low ends. From the analysis of discreet steady state operating conditions, injector pressure drop was slightly higher than predicted with an inviscid analysis, but otherwise agreed well across the design throttling range. Dynamic throttling of this injector was attempted with marginal success due to the immaturity of the throttling control system. Although the targeted mixture ratio of 6.0 was not maintained throughout the dynamic throttling profile, the injector behaved well over the wide range of conditions.
Author
Design Analysis; Throttling; Injectors; Rocket Nozzles; Reliability Analysis

20020077950 NASA Glenn Research Center, Cleveland, OH USA
Rocket Motor Joint Construction Including Thermal Barrier
Steinetz, Bruce M., Inventor, NASA Glenn Research Center, USA; Dunlap, Patrick H., Jr., Inventor, NASA Glenn Research Center, USA; Sep. 10, 2002; 12p; In English; Provisional application of US-Patent-Appl-SN-144353, filed 9 Jul. 1999
Patent Info.: Filed 27 Jun. 2000; NASA-Case-LEW-16684-1; US-Patent-6,446,979; US-Patent-Appl-SN-613053; US-Patent-Appl-SN-144353; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A thermal barrier for extremely high temperature applications consists of a carbon fiber core and one or more layers of braided carbon fibers surrounding the core. The thermal barrier is preferably a large diameter ring, having a relatively small cross-section. The thermal barrier is particularly suited for use as part of a joint structure in solid rocket motor casings to protect low temperature elements such as the primary and secondary elastomeric O-ring seals therein from high temperature gases of the rocket motor. The thermal barrier exhibits adequate porosity to allow pressure to reach the radially outward disposed O-ring seals allowing them to seat and perform the primary sealing function. The thermal barrier is disposed in a cavity or groove in the casing joint, between the hot propulsion gases interior of the rocket motor and primary and secondary O-ring seals. The characteristics of the thermal barrier may be enhanced in different applications by the inclusion of certain compounds in the casing joint, by the inclusion of RTV sealant or similar materials at the site of the thermal barrier, and/or by the incorporation of a metal core or plurality of metal braids within the carbon braid in the thermal barrier structure.
Official Gazette of the U.S. Patent and Trademark Office
Solid Propellant Rocket Engines; Thermal Barriers (Plasma Control); Joints (Junctions); Sealers

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.

20020074373 Corps of Engineers, Washington, DC USA
Engineering and Design: Cathodic Protection System Using Ceramic Anodes
Jan. 05, 1991; 132p; In English
Report No.(s): AD-A404694; USACE-ETL-1110-9-10; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This letter provides criteria for the design of impressed current cathodic protection systems using ceramic anodes. Where the application of an impressed cathodic protection system is required, the use of ceramic anodes should be considered. Where ceramic anode application has been the chosen type of cathodic protection, the enclosed design manual shall be used in the preparation of final design documents.
Derived from text
Protection; Anodes; Cathodes; Ceramic Coatings

20020074636 Eloret Corp., Moffett Field, CA USA
Prebiotic Processing induced by Comet and Meteor Impact
Dateo, Christopher E., Eloret Corp., USA; [2002]; 1p; In English; 224th American Chemical Society National Meeting, 18-22 Aug. 2002, Boston, MA, USA; Sponsored by American Chemical Society, USA
Contract(s)/Grant(s): NAS2-00062; No Copyright; Avail: Issuing Activity; Abstract Only

In their study of organic synthesis from impact shocks using the laser-induced-plasma (LIP) technique, McKay and Borucki(l) found that organic synthesis preferentially occurred in a reducing gas mixture rich in methane, and not in a mixture rich in carbon dioxide. This result means chemical models based on the thermodynamical equilibrium approach do not apply to shock chemistry. In this study, we employ the technique of reacting flow, i.e., chemical kinetics in a fluid flow, to simulate the chemistry occurring in LIP and in the wake region from comet or meteor impact. Three different air compositions have been used: (1) 1/3 CO2 and 2/3 H2, (2) pure CH4, and (3) 1/4 CH4, 1/4 CO2, and 1/2 H2O. The stoichiometric ratio of gas mixtures (1) and (3) are kept the same. For (1) we obtain equal mole fractions of CO and H2O as the major products and for (2) C2H2 is the major product. In both cases our results are in agreement with Ref. (1). For (3) we find an interesting case where the nature of chemicals produced to be critically dependent on the flowfield temperature. At the higher temperature part of the wake region, CO and H2O are the dominant products, whereas in the cooler region C2H2 is the dominant product. Further studies of these reactions, as well as for the gas mixture including N2, are being pursued.
Author
Laser Plasmas; Cometary Collisions; Meteorite Collisions; Hypervelocity Impact; Reaction Kinetics; Stoichiometry; Reacting Flow

20020076006 Department of Energy, Office of Environmental Management, Washington, DC USA
Innovative Technology Summary Report: ALARA(trademark) 1146 Strippable Coating: Deactivation and Decommissioning Focus Area
Apr. 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-766828; DOE/EM-0533; No Copyright; Avail: National Technical Information Service (NTIS)

Strippable or temporary coatings are alternative technologies for decontamination that effectively reduce loose contamination at low cost. These coatings have become a viable option during the decontamination and decommissioning (D and D) of both U.S. Department of Energy (DOE) and commercial nuclear facilities to remove or fix loose contamination on both vertical and horizontal surfaces. In a project funded by DOEs Office of Science and Technology (OST), a side-by-side assessment of six strippable coatings was performed at the Savannah River Site (SRS) by SRS and the Hemispheric Center for Environmental Technology at Florida International University (FIU-HCET). Each coating was evaluated for ease of application and removal, decontamination factors (DF), durability and cost. A summary of the results are presented in Appendix B. The decision was made, based on the results of that assessment, to demonstrate, at full-scale, the ALARA 1146 strippable coating as part of the SRS Large-Scale Demonstration and Deployment Project (LSDDP). The ALARA 1146 strippable coating successfully removed transferable (surface) contamination from multiple surfaces (metal and concrete) with an average DF for alpha contamination of 6.68 (85.0% removal). Beta contamination was removed with an average DF of 5.55 (82.0% removal). Productivity is about the same for both technologies. The rate of decontamination was about 135 sq ft/hr. Unit costs for the ALARA 1146 are $4.85/sq ft versus $2.74/sq ft for the baseline steam vacuum cleaning technology (excluding mobilization and demobilization). However, ALARATM 1146 provides a total cost savings of 33%, compared to the baseline technology, for relatively smaller jobs. For jobs less than 3,408 sq ft, the strippable coating is more cost effective, while the baseline technology is more cost effective for jobs in which more than 3,408 sq ft is to be decontaminated.
NTIS
Decontamination; Coatings; Liquid Wastes; Radioactive Wastes

20020076092 Environmental Quality Management, Inc., Cincinnati, OH USA
Field Demonstration of Lead-Based Paint Removal and Inorganic Stabilization Technologies
Hock, V. F.; Dec. 2001; 96p; In English
Report No.(s): PB2002-102037; EPA/600/R-01/055; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Today the most widespread source of lead exposure in the environment of U.S. children is lead-based paint that was applied to residential buildings before 1978. Exposure to lead in paint can come from the paint chips themselves, from dust caused by abrasion on friction surfaces, or from chalking of exterior paint. A study was conducted to demonstrate the effectiveness of a wet abrasive blasting technology to remove lead-based paint from exterior wood siding and brick substrates, and the effectiveness of two Best Demonstrated Available Technologies (BDAT) to stabilize the resultant blasting media (coal slag and mineral sand) paint debris to reduce the leachable lead content. The average lead loading of the paint coating on the wood and brick substrates was 6.9 and 51.9 mg/sq. cm., respectively. The effectiveness of the lead-based paint removal technology was determined using an X-ray fluorescence (XRF) spectrum analyzer (L&K shell). The XRF measurements were corroborated by analysis of substrate

samples using inductively-coupled plasma atomic emission spectroscopy (ICP-AES). The effectiveness of the technologies to stabilize the debris was evaluated through the Toxicity Characteristic Leaching Procedure (TCLP).
NTIS
Lead (Metal); Paint Removal; Solvents

20020076263 Georgia Inst. of Tech., George W. Woodruff School of Mechanical Engineering, Atlanta, GA USA
Computational Modeling to Support Materials Design
McDowell, David L., Georgia Inst. of Tech., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 125-151; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The objectives of materials design may differ substantially from traditional objectives of life cycle engineering or assessment of durability. Rather than just selecting off-the-shelf materials, it is increasingly the case that we can consider alternatives among materials via computation. Since each new component and application has somewhat different functional requirements, it is desirable as well to develop the machinery that permits computational assessment of the relative suitability among a range of microstructures, or to be able to choose composition and process route that result in a microstructure that delivers the desired structure-property relations. This paper considers several projects at Georgia Tech that address multiscale modeling within the overall vision of materials design.
Author
Computerized Simulation; Scale (Ratio)

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COMPOSITE MATERIALS

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

20020074580 Arizona State Univ., Dept. of Mechanical and Aerospace Engineering, Tempe, AZ USA
A New Macro-Micro Approach for Modeling Adaptive Composites ***Final Report, 15 Aug. 1997-14 Feb. 2002***
Chattopadhyay, Aditi; Thornburgh, Robert P.; Jul. 24, 2002; 164p; In English
Contract(s)/Grant(s): F49620-97-1-0419
Report No.(s): AD-A404883; XAA 0039/TE; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The objective of this research was to develop a comprehensive model for accurately and efficiently modeling smart composite structures including the effects of composite damage. First, a new, efficient method for modeling smart structures with piezoelectric devices was developed. The coupled model simultaneously solves for the mechanical and electrical response of the system using mechanical displacements and electrical displacements. The developed theory utilizes a refined higher order displacement field that accurately captures the transverse shear deformation in moderately thick laminates. The model was then extended to include internal damage in the form of delamination and matrix cracking. When delamination is present, the sublaminates are modeled as individual plates and continuity is enforced at the interfaces. Matrix cracking was modeled as a reduction in laminate stiffness using parameters determined using finite element analysis of a representative crack. Finally, the simultaneous optimization of both mechanical and electrical parameters in an adaptive structural system was studied. This study demonstrated how multidisciplinary optimization techniques, such as the Kreisselmeier-Steinhauser function, can be utilized to optimize both structural and electrical aspects of an adaptive structural system. Results have shown that the developed model is capable of accurately modeling both the mechanical and electrical response of adaptive structures.
DTIC
Composite Structures; Finite Element Method; Piezoelectricity; Mathematical Models; Mechanical Properties

20020076111 HyComp, Inc., Cleveland, OH USA
Carbon Fiber Composites
Spinoff 1997; 1997, pp. 117; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

HyComp(R), Inc. development a line of high temperature carbon fiber composite products to solve wear problems in the harsh environment of steel and aluminum mills. WearComp(R), self-lubricating composite wear liners and bushings, combines carbon graphite fibers with a polyimide binder. The binder, in conjunction with the fibers, provides the slippery surface, one that demands no lubrication, yet wears at a very slow rate. WearComp(R) typically lasts six to ten times longer than aluminum bronze. Unlike

bronze, WearComp polishes the same surface and imparts a self-lube film for years of service. It is designed for continuous operation at temperatures of 550 degrees Fahrenheit and can operate under high compressive loads.
Author
Polyimide Resins; High Temperature; Fiber Composites; Carbon Fibers; Wear

20020076290 Ames Lab., IA USA
Length Scale Correlations of Cellular Microstructures in Directionally Solidified Binary System
Shen, Y.; Aug. 01, 2002; 56p; In English
Report No.(s): DE2001-797636; IS-T 2387; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In a cellular array, a range of primary spacing is found to be stable under given growth conditions. Since a strong coupling of solute field exists between the neighboring cells, primary spacing variation should also influence other microstructure features such as cell shape and cell length. The existence of multiple solutions is examined in this study both theoretically as well as experimentally. A theoretical model is developed that identifies and relates four important microstructural lengths, which are found to be primary spacing, tip radius, cell width and cell length. This general microstructural relationship is shown to be valid for different cells in an array as well as for other cellular patterns obtained under different growth conditions. The unique feature of the model is that the microstructure correlation does not depend on composition or growth conditions since these variables scale microstructural lengths to satisfy the relationship obtained in this study. Detailed directional solidification experimental studies have been carried out in the succinonitrile-salol system to characterize and measure these four length scales. Besides the validation of the model, experimental results showed additional scaling laws to be present. In the regime where only a cellular structure is formed, the shape of the cell, the cell tip radius and the length of the cell are all found to scale individually with the local primary spacing. The presence of multiple solutions of primary spacing is also shown to influence the cell-dendrite transition that is controlled not only by the processing variables (growth velocity, thermal gradient and composition) but also by the local cell spacing. The cell-dendrite transition was found not to be sharp, but occurred over a range of processing conditions. Two critical conditions have been identified such that only cells are present below lower critics condition, and only dendrites are formed above the upper critics condition. Between these two limits, both cells and dendrites have been found to coexist. In this mixed regime, a critical local spacing is found above which a cell is unstable and forms a dendrite. An analytical expression is developed that relates the critical spacing for the cell-dendrite transition with processing conditions.
NTIS
Microstructure; Directional Solidification (Crystals); Cells (Biology); Correlation

20020076315 Norwegian Defence Research Establishment, Kjeller Norway
Strain and Frequency Analysis of Data from Slamming Drop Test Experiments
Jensen, A. E.; Sep. 29, 1999; 44p; In English
Report No.(s): PB2002-105042; FFI/RAPPORT-99/04888; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The report contains the analyses that have been performed on the results from a drop test in a fiber reinforced sandwich plate. The authors found that there is a strong tendency that the peak strain in the plate increases linearly with increasing drop velocity. The authors also found that only the fundamental frequency in air. The frequency depends on drop angle and drop velocity. The lack of higher order modes could be due to extensive air cavitation under the plate in the early impact phase which cushion the impact.
NTIS
Fiber Composites; Slamming; Drop Tests; Ships; Acceleration (Physics)

20020076370 Virginia Transportation Research Council, Charlottesville, VA USA
Environmental Durability of Graphite/Epoxy Composites: The Combined Effects of Moisture, Cathodic Polarization, and Stress *Final Report*
Pauly, C. C.; Taylor, S. R.; Gomez, J.P.; Jun. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-107973; VTRC-02-R13; Copyright; Avail: National Technical Information Service (NTIS)

The increasing acceptance and incorporation of fiber-reinforced polymer matrix composites (PMCs) as engineering construction materials have led many to look to the infrastructure as an application for these versatile materials. One such system is pultruded graphite fiber-reinforced epoxy (graphite/epoxy). Some PMC systems degrade when subjected to environmental conditions (e.g. moisture, stress, UV light, electrochemical polarization). These variables are typically studied either singularly or in series, but in real applications (e.g., aerospace, marine, infrastructure), these materials are subjected to many of these conditions simultaneously. to simulate field conditions, this study investigated the combined effects of an aqueous environment,

electrochemical polarization, and applied bending stress on the durability of a pultruded graphite/epoxy composite. The findings indicate that graphite/epoxy composites cannot be assumed to be insensitive to degradation by environmental variables. Further, electrochemical polarization, as might occur with contact with a metal such as a fastener, can accelerate degradation. This damage requires the presence of moisture. Chloride and sulfate concentrations in rain are sufficient to establish an electrolyte within crevice regions, but deicing salts would overtake these as a contributor to conductivity.
NTIS
Polymer Matrix Composites; Environmental Control; Epoxy Matrix Composites; Graphite-Epoxy Composites; Bending Fatigue

20020076389 Norwegian Defence Research Establishment, Kjeller Norway
Design and Modelling of Sandwich Plate for Drop Test
Jensen, A. E.; Berg, J. E.; Taby, J.; Sep. 1999; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-105043; FFI-RAPPORT-99/04777; No Copyright; Avail: National Technical Information Service (NTIS)
The report gives an account of the consideration and analyses that were carried out before the manufacture of a sandwich plate for a drop test. The plate was to resemble as closely as possible a wet deck panel on the new Norwegian Fast Patrol Boat, but as fibre reinforced composites are very difficult to downscale a careful weighing of physical strength and dimensions was necessary. Both static and dynamic Finite Element analyses were performed.
NTIS
Composite Materials; Sandwich Structures; Design Analysis; Models; Drop Tests

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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.

20020074571 Air Force Research Lab., Edwards AFB, CA USA
Evaluation of Afterburning Cessation Mechanisms in Fuel Rich Rocket Exhaust Plumes
Calhoon, William H., Jr; Jul. 1998; 14p; In English
Report No.(s): AD-A404895; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A computational study was conducted to identify fundamental physical processes governing the cessation or shutdown of the afterburning of fuel rich rocket exhaust with the atmosphere. Several mechanisms that have been proposed were examined which are: 1) a relaminarization phenomenon, 2) a Damkoehler number effect and 3) a classical flame extinction mechanism. Analysis of the simulation results revealed the relaminarization mechanism to be implausible while the Damkoehler number effect and the flame extinction mechanisms were found to be valid. The extinction mechanism was also found to dramatically alter the emission characteristics and enhance the shutdown behavior which has important implications with respect to radiative heat transfer to the body and missile intercept systems. This is a significant finding because strain rate induced extinction is a previously unrecognized phenomena occurring in rocket exhaust plumes during afterburning cessation.
DTIC
Afterburning; Exhaust Gases; Plumes; Rocket Exhaust; Jet Engine Fuels

20020074575 Air Force Research Lab., Edwards AFB, CA USA
Design and Test Results of an Advanced Liquid Hydrogen Turbopump
Crease, G.; Lyda, R.; Park, J.; Minick, A.; Jun. 15, 1999; 14p; In English; Prepared in collaboration with Pratt and Whitney, West Palm Beach, FL
Report No.(s): AD-A404890; AIAA-99-2190; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This paper discusses the design, the test facility, and the test results of an Advanced Liquid Hydrogen Turbopump for a 30,000 pound (22,679 kg) thrust Upper Stage Expander Cycle Engine being developed by Pratt & Whitney Liquid Space Propulsion under contract for the USA Air Force Research Laboratory (AFRL) to support the Integrated High Payoff Rocket Technology (IHPRPT) program. The Advanced Liquid Hydrogen Turbopump is designed to provide improved system thrust to weight, decreased hardware/support costs, and increased reliability. These benefits will be accomplished and demonstrated through

design, development, and test of this high speed, high efficiency, two stage hydrogen turbopump capable of supplying 16 lb m/sec (7.3 kg/sec.) of liquid hydrogen at 4600 psia (323.4 kg/sq cm).
DTIC
Liquid Hydrogen; Turbine Pumps; Rocket Test Facilities; Propulsion

20020074592 New South Wales Univ., School of Chemical Engineering and Industrial Chemistry, Australia
The Homopolymerization and Copolymerization of Dimethyl Itaconate: A Mechanistic and Kinetic Study
Yee, Lachlan Hartley, New South Wales Univ., Australia; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

This work is an investigation into the polymerization kinetics of dimethyl itaconate (DMI). The determination of homopolymerization k(sub p) at several frequencies and temperatures (20 - 50 C) was achieved using Pulsed Laser Polymerization (PER). Calculation of Arrhenius parameters showed that a significantly lower frequency factor confirms that DMI is more statically hindered than methyl methacrylate. PLP was also used to measure k(sub p), in the bulk copolymerization reaction of DMI and STY at 20 C. The measured k(sub p) values were substantially higher (up to a factor of 3) than those predicted by the terminal model. This unusual result is attributed to strong entropic penultimate unit effects on the DMI-terminal radicals. The Mayo and CLD methods were used to determine CS for both n-dodecanethiol (DDM) and carbon tetrabromide in bulk DMI homopolymerization. Compared to methyl methacrylate (MMA), it is clear that an increased CS value (approx. 4 times) was largely due to static effects in DMI. The chain transfer activation energies of both MMA and DMI are similar in magnitude. Hence, the reduced value of k(sub tr), found for DMI is largely due to a reduced pre-exponential factor. Discussions of the development of multi-detector size exclusion chromatography to obtain Molecular Weight (MW) data throughout this thesis are made. Absolute MW determination requires a multi-detector setup. The time separation between detectors is referred to as the Inter-Detector Delay (IDD). It was concluded that IDD is independent of MW. The data obtained in the PLP homopolymerization study of DMI was subjected to modelling. The simulation program PREDICT(R) was used. The important role of primary radical termination (PRINT) in a statically hindered system was confirmed. It was also concluded that an absolute accurate value for the PRINT rate coefficient, k(sub 1), is essential to determine k(sub p) The possible presence of transfer-to-initiator in the benzoin initiated DMI polymerizations required appropriate model adjustments.
Author
Kinetics; Dimethyl Compounds; Methyl Compounds; Copolymerization

20020074617 NASA Ames Research Center, Moffett Field, CA USA
Systematic Underutilization of Glutamine In Thermophile Proteins
Liang, Shoudan, NASA Ames Research Center, USA; Weber, Arthur, NASA Ames Research Center, USA; [2002]; 1p; In English; Genome Informatics, 4-8 Sep. 2002, Cambridge, UK
Contract(s)/Grant(s): RTOP 755-30-11; No Copyright; Avail: Issuing Activity; Abstract Only

Rapid racemization above 100 C of L-amino acids to Domino acids, as well as deamidation, is probably a hazard for high temperature life. For example, the half-life of some asparaginyl peptides can be as short as 10 minutes at 100 C. High temperature organisms could protect themselves by reducing usage of amino acids that are easily racemized/deamidazed, by having a rapid rate of protein turnover which requires energy, or by adapting special cis-peptide conformations. We have searched eight completely sequenced thermophile genomes, and compare them to mesophile genomes, in order to identify underutilized amino acids. to our surprise, asparagine, the most unstable amino acid to deamidation, is used at about the same level in thermophile proteins in comparison to mesophiles whereas it is the second most unstable amino acid, glutamine, that is underutilized in all of eight thermophile species. Glutamines are present at 2% level in a typical thermophile protein, instead of 4% in mesophile. We argue that it is easier to protect asparagines from deamidation by cis-peptide conformations. We discuss statistical as well as structural evidence in support of our conclusions.
Author
Thermophiles; Proteins; Glutamine; Amino Acids

20020074772 Galaxy Scientific Corp., Egg Harbor Township, NJ USA
Fire-Resistant Cyanate Ester-Epoxy Blends ***Final Report***
Walters, Richard N.; May 2002; 20p; In English
Report No.(s): AD-A404942; DOT/FAA/AR-02/53; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The cure chemistry, thermal stability, and fire behavior in a series of fire-resistant cyanate ester-epoxy blends were examined. The dicyanate and diepoxide of 1,1-dichloro-2,2-bis(4-hydroxyphenyl)ethylene (bisphenol-C, BPC) were combined in various molar ratios, and the reaction chemistry was monitored using Fourier Transform Infrared Spectroscopy (FTIR) and differential

scanning calorimetry (DSC). Fire behavior of the BPC cyanate-epoxy blends was studied in flaming and nonflaming combustion, using fire calorimetry and pyrolysis-combustion flow calorimetry, respectively.
DTIC
Esters; Cyanates; Epoxy Matrix Composites; Fabrics; Flame Retardants

20020074825 Northwestern Univ., Materials Science Center, Evanston, IL USA
Doping Mechanisms in Wide Bandgap Group III Nitrides ***Final Report, 1 Oct. 2000-30 Sep. 2001***
Wessels, Bruce W.; Jul. 18, 2002; 42p; In English
Contract(s)/Grant(s): N00014-01-1-0012
Report No.(s): AD-A404872; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The role of charge transfer and Fermi level position on impurity solubility, native defect formation and stability in GaN semiconductors was investigated. Several issues were addressed that include: (1) the structure, identity, solubility and stability of intentionally added and unintentional compensating donor defects in p-type and its material, (2) the role hydrogen complexes play in compensating p-type layers, and (3) the role oxygen and Si play in formation of defect complexes with Mg in GaN. The main objective was to determine the factors, which limit p-type conductivity in GaN and its alloys and to develop doping techniques to increase the hole concentrations to greater than 10(exp 19)/cu cm. The concentrations of both native defects and impurities were measured and its dependence on Fermi level determined. From the measured defect concentrations, the formation energies were calculated and compared to recent first principles, total-energy calculations for both native defects and impurities.
DTIC
Nitrides; Energy Gaps (Solid State); Semiconductors (Materials); Additives

20020074833 Auburn Univ., AL USA
Electron Emitters ***Final Report, 1 May 1998-30 Apr. 2002***
Tzeng, Yonhua; Jul. 31, 2002; 70p; In English
Contract(s)/Grant(s): N00014-98-1-0571
Report No.(s): AD-A404829; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

When two carbon-nanotube coated electrodes are placed at a small distance from each other, electron emission from carbon nanotubes allows a DC or AC electrical current to flow between these two electrodes. The voltage drop across these two electrodes depends on the electric field needed for emitting electrons necessary for carrying electric current and the distance between these two electrodes. This electrical coupler may find applications to high-voltage circuits, which operate at voltages of a much larger value than what is needed across the electrical coupler to supply the current. Because of the non-contact nature of this class of electrical coupler, two electrodes are allowed to move with respect to each other while keeping the gap spacing constant and allowing the DC or AC power to be coupled from one electrode to the other.
DTIC
Electron Emission; Carbon

20020074836 Air Force Research Lab., Edwards AFB, CA USA
Military and Commercial Benefits of AFRL POSS Technology: Leveraging R&D investments Under Technology Transfer
Veselenak, Jeff; Nov. 1999; 27p; In English
Report No.(s): AD-A404863; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In an attempt to meet the U.S, Air Forces's demand for a new generation of lighter weight, higher performance polymeric materials, the U.S. Air Force Office of Scientific Research and the U.S. Research Laboratory Propulsion Directorate have, for the past six years, pursued the development of new chemical feedstock technologies based on Polyhedral Oligomeric Silsesquioxanes (POSS).
DTIC
Technology Transfer; Propulsion; Aircraft Construction Materials; Ferroelectric Materials

20020074903 Thiokol Chemical Corp., Brigham City, UT USA
Utilization of Ammonium Dinitramide (ADN) in Propellant Formulations
Mar. 23, 1998; 6p; In English
Contract(s)/Grant(s): N00014-95-C-0215; N00174-95-C-0078
Report No.(s): AD-A405066; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Utilization of the high energy oxidizer ammonium dinitramide (ADN) gives several desirable characteristics when employed in solid propellants. These include non- chlorine combustion products (attractive for applications where hydrochloric acid might

contaminate sensitive payload components), facile extraction into water (suitable for water washout/ingredient recovery and/or reuse demilitarization methods), simple methods for destruction (easily converted into the fertilizer ammonium nitrate), and attractive performance and ballistic characteristics. At Thiokol the viability of ADN as a propellant ingredient has been greatly enhanced by the use of additives to stabilize the material and a prilling process to give spherical, defect-free particle morphology, ideal for propellant formulating. The major technical challenge remaining is to reduce the hazards of propellants which contain ADN as the main oxidizer.
DTIC
Ammonium Compounds; Solid Propellants; High Energy Oxidizers; Amides; Ballistics

20020074992 Hughes Technical Center, Atlantic City International Airport, NJ USA
Combustibility of Cyanate Ester Resins ***Final Report***
Lyon, Richard E.; Walters, Richard; Gandhi, S.; Jun. 2002; 26p; In English
Report No.(s): AD-A405004; DOT/FAA/AR-02/44; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flaming and nonflaming combustion studies were conducted on a series of polycyanurates to examine the effect of chemical composition and physical properties on the fire behavior of these cross-linked, char-forming thermoset polymers. Heats of complete combustion of the polymer and fuel gases were determined by oxygen bomb calorimetry and pyrolysis-combustion flow calorimetry, respectively. Fire calorimetry experiments were conducted to measure the heat released, the rate of heat release, and the smoke generation in flaming combustion. Fire response parameters derived from the data include the thermal inertia, heat of gasification, effective heat of combustion, and combustion efficiency. Halogen-containing polycyanurates exhibited extremely low heat release rate in flaming combustion compared to the hydrocarbon resins, yet produced significantly less smoke and comparable levels of carbon monoxide and soot.
DTIC
Esters; Cyanates; Flammability; Tests; Chemical Composition; Thermodynamic Properties

20020075554 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
AP Counter Flow Diffusion Flame Condensed Phase Thermal Measurements
Parr, T. P., Naval Air Warfare Center, USA; Hanson-Parr, D. M., Naval Air Warfare Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 23-32; In English; Also announced as 20020075551
Contract(s)/Grant(s): N00014-01-WX-20621; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The counter flow diffusion flame configuration is a very useful technique for studying Ammonium Perchlorate (AP) gas phase diffusion flame chemistry and structure in a controllable and diagnostically amenable fashion. Quantitative species and temperature profiles have previously been measured for several different fuels and compared with detailed kinetics gas phase models. The models are being independently extended to handle condensed phase kinetics. We have undertaken measurements of the surface temperature and condensed phase temperature profile as possible inputs to validate these models. Comparisons with a simple de-coupled one step condensed phase model are given.
Author
Ammonium Perchlorates; Diffusion Flames; Chemical Analysis; Flow Characteristics

20020075556 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
BTTN Flame Structure
Parr, Tim, Naval Air Warfare Center, USA; Hanson-Parr, Donna, Naval Air Warfare Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 43-49; In English; Also announced as 20020075551
Contract(s)/Grant(s): N00014-01-WX-20621; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The non-intrusive technique of single-point spontaneous laser Raman spectroscopy was used to map out species and temperature profiles above the surface of BTTN burning in air at one atmosphere pressure (0-093 MPa). At this pressure only the primary stage flame ignited, but the material would still regress with that flame alone. Fine-wire and foil thermocouples were used to measure the gas phase and surface temperatures. NO, CO, and H2O were found to be the major species near the surface, and H2, CH4, N2, C2H4, CO2 and HCN were minor species. The surface temperature was 530 K and the gas temperature just above the surface was only about 1200K.
Author
Raman Spectroscopy; Temperature Profiles; Nonintrusive Measurement; Surface Temperature; Butanes; Trinitro Compounds

20020075557 Brigham Young Univ., Provo, UT USA

Implementation of Automatically Simplified Chemical Kinetics through Intrinsic Low-Dimensional Manifolds for Gaseous HMX

Hedengren, J. D., Brigham Young Univ., USA; Beckstead, M. W., Brigham Young Univ., USA; Spinti, J., Utah Univ., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 51-68; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

An automated method to generate, validate, and implement an intrinsic low-dimensional manifold (ILDM) has been developed. This method has been applied to a detailed mechanism for gaseous HMX that contains 44 species and 232 reactions. The resulting ILDM tracked detailed chemistry based on enthalpy, pressure, and mass fraction of N2. A one-dimensional BYU combustion program has been used to compare the ILDM with the detailed mechanism. Simulations show that the ILDM is an adequate representation of detailed kinetics away from the reacting surface (less than 100 microns). An advantage of the ILDM method is that computational time is reduced by an order of magnitude. However, this advantage can be offset by the development time required to create and implement the ILDM method.

Author

Reaction Kinetics; Technology Assessment; HMX

20020075560 Illinois Univ. at Urbana-Champaign, Center for the Simulation of Advanced Rockets, Urbana, IL USA

The Three-Dimensional Combustion of Heterogeneous Propellants

Massa, L., Illinois Univ. at Urbana-Champaign, USA; Jackson, T. L., Illinois Univ. at Urbana-Champaign, USA; Buckmaster, J., Illinois Univ. at Urbana-Champaign, USA; Campbell, M., Illinois Univ. at Urbana-Champaign, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 99-105; In English; Also announced as 20020075551

Contract(s)/Grant(s): B341494; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A numerical framework is described which permits the calculation of the 3-D combustion field supported by a heterogeneous propellant, allowing for complete coupling between the condensed phase physics, the gas-phase physics, and the unsteady, uneven, regressing surface. A random packing algorithm is used to construct models of ammonium-perchlorate in hydroxyl-terminated-polybutadiene propellants which mimic experimental propellants designed by R. Miller, and these are numerically burnt. Mean burning rates are compared with experimental data for four packs, over a pressure range of 7-200atm.

Author

Three Dimensional Models; Numerical Analysis; Heterogeneity; Propellant Combustion

20020075561 Illinois Univ. at Urbana-Champaign, Urbana, IL USA

Flame and Burning Surface Structure of AP/HTPB Laminate Propellants

Fitzgerald, R. P., Illinois Univ. at Urbana-Champaign, USA; Brewster, M. Q., Illinois Univ. at Urbana-Champaign, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 107-118; In English; Also announced as 20020075551

Contract(s)/Grant(s): N00014-95-1-1339; B341494; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Combustion of two-dimensional laminate propellants of ammonium perchlorate (AP) and hydroxyl-terminated polybutadiene (HTPB) binder oxygenated with fine-AP is investigated experimentally. The experiments use UV emission and transmission imaging to obtain information about flame structure, burning surface profile, and burning rate. The experimentation is being used to verify and test assumptions associated with a numerical model that is being developed that is based on finite-rate chemistry with simplified kinetics and a free surface. Results show that for equivalent, overall stoichiometric amounts of AP and HTPB, flame-surface structure is a function of length scale (in this case, fuel-layer thickness), pressure, and equivalence-ratio disparity between the non-premixed fuel and oxidizer regions (binder-matrix equivalence ratio). Factors that promote split (diffusion) flame-surface structure are large length-scale, high pressure, and large equivalence-ratio disparity. The opposite factors (including oxygenating the binder) promote merged (premixed) flame-surface structure. Crossover conditions for the two regimes have been determined. The transition thickness between split and merged structure is as much as an order of magnitude larger for oxygenated binder than for pure binder. A correlation has been found between the transition thickness and the optimal thickness at which burn rate is maximized for a given pressure. The low pressure deflagration limit of coarse AP has also been shown to impact the burn rate as well as the surface structure of laminate propellants. The issue of lateral boundary conditions was also investigated experimentally using triple fuel-layer laminates. It was found that flame-surface structure at the center of the laminate is relatively uninfluenced by the outer boundary conditions. Additional model development and experimental data needs to be obtained to demonstrate quantitative agreement over a wide range of conditions.

Author
Surface Geometry; Ammonium Perchlorates; HTPB Propellants; Two Dimensional Models; Experimentation; Burning Rate; Diffusion Flames

20020075562 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
HMX/GAP/BTTN Propellant Flame Structure
Parr, Tim, Naval Air Warfare Center, USA; Hanson-Parr, Donna, Naval Air Warfare Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 129-142; In English; Also announced as 20020075551
Contract(s)/Grant(s): N00014-01-WX-20621; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The non-intrusive techniques of planar laser-induced fluorescence, ultraviolet-visible absorption spectroscopy and spontaneous laser Raman spectroscopy were used to map out species and temperature profiles above the surface of self-deflagrating HMX/GAP/BTTN model propellant with a pseudo premixed flame. CO, H2O, NO2, and H2CO were found to be the major species at the surface, NO, CO, H2O, and HCN in the dark zone, and CO, H2, H2O, and CO2 in the burnt gases. A dark zone of about 1400-1450 K was observed in which the NO and HCN concentrations were at their highest of about 15.5 and 13.5 mole %, respectively. NO2 peaked close to the surface at about 5 mole %. Formaldehyde and N2O Were also observed in the gas phase, peaking at the surface at about 7 and 8 mole %, respectively. Thermal diffusivity and specific heat capacity as a function of temperature were also measured. Analysis of thermocouple measurements showed a surface temperature of 785 K. Comparisons are made between this propellant and the previously investigated RDX analog.
Author
HMX; Intrusion; Temperature Profiles; Surface Temperature; Premixed Flames; Thermal Diffusivity; Vapor Phases

20020075563 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
Window Bomb Burning Rates of BTATZ, DAAT, and HNF
Atwood, A. I., Naval Air Warfare Center, USA; Bui, D. T., Naval Air Warfare Center, USA; Curran, P. O., Naval Air Warfare Center, USA; Ciaramitaro, D. A., Naval Air Warfare Center, USA; Lee, K. B., Agency for Defense Development, Korea, Republic of; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 119-127; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

This paper presents a progress report on studies being made to characterize new, high burning rate materials being considered as potential solid propellant ingredients. The effect of synthesis procedure on the burning rate and burning rate pressure exponent is illustrated for the high nitrogen containing compound 3,6-bis(1H-1,2,3,44etrazol-5-amino) -2-tetrazine (BTATZ). It appears that the use of dimethy1formamide (DMF) in the final synthetic step not only results in higher burning rate materials, but also reduced burning rate pressure exponents. The effect of BTATZ on ammonium dinitramide (ADN) burning rate is illustrated. Burning rates of hydrazinium nitroformate (HNF) obtained from two sources were very comparable. The BTATZ, di-amino-azo-tetrazine (DAAT) N-oxides and HNF are compared to neat burning rate data of more familiar compounds of ADN, hexanitrohexazaisowurtzitane (CL-20), and cyclotetramethylenetetranitramine (HMX).
Author
Burning Rate; Solid Propellants; Hydrazinium Compounds; HMX; Azo Compounds

20020075564 Brigham Young Univ., Provo, UT USA
RDX/GAP Pseudo-Propellant Combustion Modeling
Puduppakkam, Karthik V., Brigham Young Univ., USA; Beckstead, Merrill W., Brigham Young Univ., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 143-156; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A 3-phase steady-state one-dimensional numerical model, which incorporates a 7-step condensed phase and a 437-step gas phase kinetic mechanism, has been used to simulate the combustion of RDX/GAP pseudo-propellant. Combustion characteristics of three different compositions of RDX/GAP have been analyzed using the model, in addition to monopropellant RDX and GAP. The studies have been performed at pressures spanning from 1 atm to 100 atm and initial temperatures of 298 +/- 20 K. The burning rates of the RDX/GAP compositions were predicted to be below that of both monopropellant RDX and GAP. For the compositions studied, the model predicted a decrease in burning rate pressure exponent with increasing GAP content. The addition of GAP was predicted to decrease the gas phase heat feedback significantly and increase the condensed phase thickness. The temperature

sensitivity increased with the GAP content. Dark zones were predicted for a few cases when the pseudo-propellant had 20% GAP or more.
Author
RDX; Steady State; Mathematical Models; Vapor Phases; Condensates; Propellant Combustion

20020075567 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA
Progress in the Development of a Computational Model for Hypergolic Gel-Bipropellant Combustion in the Impinging Stream Vortex Engine
Nusca, Michael J., Army Research Lab., USA; Michaels, R. Scott, Army Aviation Research, Development and Engineering Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 179-191; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The Army is developing gelled bipropellants and tactical missile propulsion systems that utilize these propellants for both current and future combat systems. The use of hypergolic gel propellants introduces new challenges in combustion control. One of these challenges is the mixing of oxidizer and fuel to obtain maximum performance from the combustor without increasing the size of the engine. The impinging stream vortex engine, ISVE, offers an alternative to increasing the volume of the combustion chamber and has already generated excellent performance test data. Since the ISVE is a new concept, analytical models that relate engine performance to engine design parameters are just beginning to emerge. In order to fully exploit the performance advantages that have been realized for the ISVE, it is desirable to understand the underlying flow physics of the engine. This paper describes the Army's effort to use modem computational fluid dynamics, combined with high-performance computers to generate computational simulations of the ISVE that reveal gas dynamics and combustion patterns as well as predict chamber pressure and thrust levels for the engine.
Author
Computational Fluid Dynamics; Computer Programs; Mathematical Models; Propulsion System Performance; Combustion Chambers; Thrust; Vortices; Gelled Rocket Propellants

20020075568 NASA Marshall Space Flight Center, Huntsville, AL USA
Elimination of Intermediate-Frequency Combustion Instability in the Fastrac Engine Thrust Chamber
Rocker, Marvin, NASA Marshall Space Flight Center, USA; Nesman, Tomas E., NASA Marshall Space Flight Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 193-207; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A series of tests were conducted to measure the combustion performance of the Fastrac engine thrust chamber. The thrust chamber exhibited benign, yet marginally unstable combustion. The marginally unstable combustion was characterized by chamber pressure oscillations with large amplitudes and a frequency that was too low to be identified as acoustic or high-frequency combustion instability and too high to be identified as chug or low-frequency combustion instability. The source of the buzz or intermediate-frequency combustion instability was traced to the fuel venturi whose violently noisy cavitation caused resonance in the feedline downstream. Combustion was stabilized by increasing the throat diameter of the fuel venturi such that the cavitation would occur more quietly.
Author
Combustion Stability; Performance Tests; Thrust Chambers; Engine Control

20020075569 NASA Marshall Space Flight Center, Huntsville, AL USA
Characterization of Low-Frequency Combustion Stability of the Fastrac Engine
Rocker, Marvin, NASA Marshall Space Flight Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 209-245; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A series of tests were conducted to measure the combustion performance of the Fastrac engine thrust chamber. During mainstage, the thrust chamber exhibited no large-amplitude chamber pressure oscillations that could be identified as low-frequency combustion instability or "chug". However, during start-up and shutdown, the thrust chamber very briefly exhibited large-amplitude chamber pressure oscillations that were identified as chug. These instabilities during start-up and shutdown were regarded as benign due to their brevity. Linear models of the thrust chamber and the propellant feed systems were formulated for both the thrust chamber component tests and the flight engine tests. These linear models determined the frequency and decay rate of chamber pressure oscillations given the design and operating conditions of the thrust chamber and feed system. The frequency of chamber pressure oscillations determined from the model closely matched the frequency of low-amplitude, low-frequency chamber pressure oscillations exhibited in some of the later thrust chamber mainstage tests. The decay rate of the

chamber pressure oscillations determined from the models indicated that these low-frequency oscillations were stable. Likewise, the decay rate, determined from the model of the flight engine tests indicated that the low-frequency chamber pressure oscillations would be stable.
Author
Low Frequencies; Combustion Stability; Engine Tests; Performance Tests; Thrust Chambers

20020075571 Army Research Lab., Aberdeen Proving Ground, MD USA
Investigation of the Role of Plasma Chemistry in the Plasma-Propellant Ignition (PPI) Process
Fifer, R. A., Army Research Lab., USA; Sagan, E. S., Army Research Lab., USA; Beyer, R. A., Army Research Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 259-258; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Experiments have been carried out to explore the role of chemical effects in the plasma-propellant interaction (PPI) process. The experiments involve varying the chemical composition of a confined, ablatively-"fed" plasma, and then observing the response of the propellant (JA2, M9 or M30) via the recorded pressure traces. The combustion is terminated by rapid depressurization, allowing recovery and chemical analysis. In-situ light emission measurements provide information on the relative temperatures of the plasmas investigated, as well as on the relative radiation levels at the propellant surface. The standard polyethylene (PE)-fed plasma contains C, H and Al (the exploding wire is aluminum). A C-rich plasma (without H) is formed with a graphite(Gr) or lampblack (LB)-fed plasma, and a H-rich plasma with an aluminum hydride (AIH3)-fed plasma. In addition, ammonia triborane (ATB), another H-rich reducing agent, has been tested. The results show widely varying extents of plasma-feeding for the different plasma chemistries, higher plasma temperatures (and longer duration of high temperature and radiation) for the chemistries that feed the plasma least, and post-discharge propellant combustion rates that suggest competition between the opposing radiative and pressure-producing properties of the additive.
Author
Plasma Chemistry; Plasma Jets; Propellant Combustion; Interactions; Chemical Effects; In Situ Measurement

20020075576 Goodrich Corp., Phoenix, AZ USA
Development and Testing of Goodrich 244 Fire Suppressant
Olander, Donald E., Goodrich Corp., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 345-351; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Goodrich has developed an active non-ozone depleting replacement for Halon(R). It is intended primarily for critical applications such as aircraft cargo holds, maritime engine and equipment rooms, etc, as a total flooding agent. Fire suppression tests have been performed in full-scale test devices rather than using laboratory tests. The surprising result show that the weight of the new suppressant needed is 7% of that of Halon(R) 1301 in the identical tests. The stored volume of the suppressant is approximately 3% of that required for Halon 1301. For fire suppression lasting longer than 30 minutes, 2-1/2 pounds of suppressant agent for each 1000 cubic feet of enclosure is recommended. Goodrich 244 is a solid propellant using potassium bromate as the principal oxidizer. Approximately 47% of the effluent is potassium bromide, the active fire suppressant. The gaseous products are water, carbon dioxide and nitrogen, The bromine atom is in a solid ingredient both before and after use. Therefore, the Ozone Depletion Potential is zero. The only global warming agent in the effluent is carbon dioxide, which constitutes 24% of the effluent. Therefore, the global warming potential is 0.2. Because the Acute Inhalation Test ("rat test") show no gross abnormalities after a 4 hour exposure followed by 2 weeks observation and necropsy, the SNAP approval is for limited times in inhabited spaces. The fire suppressant data were obtained by testing in a chamber, which is a surrogate of a cargo bay in the DC-10 aircraft. It is agreement with the design published by the FAA. Instrumentation includes 45 thermocouples, FTIR analyses, oxygen concentration meter, and aerosol chemical concentration equipment, visible and IR videos and two pressure transducers.
Author
Aerosols; Bays (Structural Units); Carbon Dioxide; Full Scale Tests; Ozone Depletion; Solid Propellants

20020075580 Los Alamos National Lab., NM USA
A Model of Thermal Decomposition and Ignition in HMX
Henson, Bryan F., Los Alamos National Lab., USA; Smilowitz, Laura, Los Alamos National Lab., USA; Asay, Blaine W., Los Alamos National Lab., USA; Dickson, Peter M., Los Alamos National Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 387-395; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

We present a global chemical decomposition model for HMX based materials and discuss its application to questions concerning the evolution of explosive morphology during thermal decomposition and the prediction of energy release subsequent to ignition. The model contains three component processes, the initial beta to delta phase transition, solid to gas decomposition and gas phase ignition, for which all kinetic and thermodynamic parameters are fixed by independent measurement. We present a very simple isothermal ignition calculation over the range of temperatures from thermal explosion to detonation. The calculation is performed for a sphere of material and the critical diameter and time for ignition are determined. The sample diameter, and thus the balance of heat generation and dissipation, is the only degree of freedom in the calculation. The results of the calculation are in good agreement With data with respect to both the ignition times and length scales over the full temperature range of energetic response in HMX. We discuss this particular success of the model as an indication that key components of the process of decomposition and ignition are in place. We also discuss details of the current model which will be insufficient to capture essential features of the decomposition, principally the physical and structural evolution of the material during heating. Finally we discuss how these features may be incorporated into the model, and how these features will provide additional detail in understanding the state of the material at ignition and consequent energy release.
Author
Thermal Decomposition; Chemical Analysis; HMX; Heat Generation; Thermodynamic Properties

20020075584 Lawrence Livermore National Lab., Livermore, CA USA
Deflagration Behavior of PBXN-109 and Composition B at High Pressures and Temperatures
Maienschein, Jon L., Lawrence Livermore National Lab., USA; Wardell, Jeffrey F., Lawrence Livermore National Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 425-433; In English; Also announced as 20020075551
Contract(s)/Grant(s): W-7405-eng-48; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

We report deflagration rate measurements on PBXN-109 (RDX/Al/HTPB) and Composition B (RXD/TNT/wax) at pressures from 1,500 - 100,000 psi (10-700 MPa). This was done with the LLNL High Pressure Strand Burner, in which embedded wires are used to record the time-of-arrival of the bum front in the cylindrical sample as a function of pressure. The propellant samples are 6.4 mm in diameter and 6.4 mm long, with bum wires inserted between samples. Burning on the cylindrical surface is inhibited with an epoxy or polyurethane layer. With this direct measurement we do not have to account for product gas equation of state or heat losses in the system, and the bum wires allow detection of irregular burning. We report deflagration results for PBXN-109 as received, and also after it has been damaged by heating. The bum behavior of pristine PBXN-109 is very regular, and exhibits a reduction in pressure exponent from 1.32 to 0.85 at pressures above 20,000 psi (135 MPa). When PBXN-109 is thermally damaged by heating to 170-180 C, the deflagration rate is increased by more than a factor of 10. This appears to be a physical effect, as the faster burning may be explained by an increase in surface area. Our results with Composition B show an apparent 2nd order pressure dependence for initial deflagration, followed by deconsolidation and onset of very rapid and erratic burning. The deconsolidation may be the result of the TNT melting as heat flows into the sample.
Author
Deflagration; RDX; Combustion; HTPB Propellants; Heat Transfer

20020075597 Georgia Inst. of Tech., School of Aerospace Engineering, Atlanta, GA USA
Bimodal and Ultra-Fine Aluminum Effects on Propellant Combustion
Seitzman, J. M., Georgia Inst. of Tech., USA; Dokhan, A., Georgia Inst. of Tech., USA; Price, E. W., Georgia Inst. of Tech., USA; Sigman, R. K., Georgia Inst. of Tech., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 625-636; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

An experimental investigation was carried out to evaluate the combustion behavior of aluminized, ammonium perchlorate composite propellants, with various Al particle sizes, including bimodal aluminum size distributions using ultra-fine aluminum (UFAl, approx. 0.1 micron) as the fine component. It was found that the burning rate could be increased several fold with UFAl, with major increases produced by an aluminum blend with only 20% UFAl under some conditions. Presence of UFAl had a major effect on the appearance of the flame, and on the amount and size distribution of the Al2O3 product particles. Explanations of the burning rate effect of fine Al are proposed that involve rapid Al combustion, and include Al ignition and oxidizer availability as important variables. Some possible causes of the effects on the product oxide size are also discussed.
Author
Propellant Combustion; Propellant Additives; Metal Propellants; Composite Propellants; Ammonium Perchlorates; Aluminum

20020075598 Naval Air Warfare Center, Weapons Div., China Lake, CA USA

Combustion Behavior of Aluminized Propellants in PCP Binder

Bui, D. T., Naval Air Warfare Center, USA; Chan, M. L., Naval Air Warfare Center, USA; Atwood, A. I., Naval Air Warfare Center, USA; AtienzaMoore, T. M., Naval Air Warfare Center, USA; Curran, P. O., Naval Air Warfare Center, USA; Turner, A. D., Naval Air Warfare Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 637-648; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

This paper presents progress accomplished during an exploratory investigation of the steady-state combustion behavior of aluminized propellants. The main focus of this investigation was to study the combustion behavior of polycaprolactone polyol/aluminum/ammonium perchlorate (PCP/AVAP) propellants by evaluating the effect of diminishing aluminum particle size (from 60 to 0.18 microns) on parameters such as burning rate, combustion efficiency, and processibility. The effect of aluminum coarse-to-fine (c/f) mass ratio on those same parameters was also examined in an effort to enhance the processibility of PCP/AI/AP propellants with a portion of ALEX(R). For this part of the effort, H15 was used as the coarse aluminum and ALEX(R) as the fine. Techniques such as cinephotomicrography, particle collection, and photomicrography of combustion residues were utilized to characterize combustion behavior. All burning rates were measured in duplicate at pressures of 50, 100, 200, 400, 600, 800, 1000, and 1500 psia in a nitrogen atmosphere at an initial temperature of 298 K. A pressure of 50 psia was selected for still pictures and residue collection. The results indicate that nano-sized aluminum (i.e., ALEX(R)) can be used to enhance the burning rate of PCP/AI/AP propellant. It was also found that an aluminum c/f mass ratio of 1:1 was optimum to improve the processibility of ALEX(R)-based propellant and still maintain the burning rate enhancement.

Author

Combustion Efficiency; Aluminum Perchlorates; Propellant Combustion; Propellant Additives

20020076010 Department of Energy, Office of Environmental Management, Washington, DC USA

Innovative Technology Summary Report: Fenton's Reagent: Subsurface Contaminants Focus Area

Oct. 1999; In English

Report No.(s): DE2002-769189; DOE/EM-0484; No Copyright; Avail: National Technical Information Service (NTIS)

The release of contaminants such as solvents and other volatile organic compounds (VOCs) into surface impoundments or through other disposal practices has resulted in the contamination of the subsurface at numerous DOE and other sites across the nation. These organic contaminants were often introduced to the subsurface as a pure phase that was either lighter than or heavier than water. Those compounds heavier than water, such as solvents, are commonly known as DNAPLs (dense, non-aqueous phase liquids) when they are present as a separate phase. Those compounds lighter than water, such as gasoline, are commonly known as LNAPLs (light, non-aqueous phase liquids) when they are present as a separate phase. DNAPLs are often found both above and below the water table and LNAPLs are found above the water table, near the original source area where the contaminant was introduced into the subsurface. DNAPLs and LNAPLs in the subsurface are difficult to remove by pump-and-treat methods, can be difficult to detect and treat in situ, and act as significant sources of contamination continuously released to the ground water.

NTIS

Contamination; Volatile Organic Compounds; Solvents; Water Pollution; Soil Pollution

20020076082 Hughes Technical Center, Fire Safety Research and Development, Atlantic City International Airport, NJ USA

Icing Design Envelopes (14 CFR Parts 25 and 29, Appendix C) Converted to a Distance-Based Format ***Final Report***

Jeck, R. K.; Apr. 2002; 62p; In English

Report No.(s): PB2002-107034; DOT/FAA/AR-00/30; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The conventional liquid water content (LWC) vs mean effective diameter envelopes in Appendix C of 14 CFR Parts 25 and 29 can be redrawn in an equivalent, more versatile form of LWC vs horizontal extent. This document shows how that is done, and it illustrates a number of advantages and uses of this new, distance-based format for the envelopes.

NTIS

Ice Formation; Moisture Content

20020076105 National Energy Technology Lab., Pittsburgh, PA USA

Molecular sieves as catalysts for methanol dehydration in the lpdmetm process

Wang, A. W.; Apr. 01, 2002; 31p; In English

Report No.(s): DE2001-797621; FC22-95PC93052--50; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Several classes of molecular sieves were investigated as methanol dehydration catalysts for the LPDME(trademark) (liquid-phase dimethyl ether) process. Molecular sieves offer a number of attractive features as potential catalysts for the conversion of methanol to DME. These include (1) a wide range of acid strengths, (2) diverse architectures and channel connectivities that provide latitude for steric control, (3) high active site density, (4) well-investigated syntheses and characterization, and (5) commercial availability in some cases. We directed our work in two areas: (1) a general exploration of the catalytic behavior of various classes of molecular sieves in the LPDME(trademark) system and (2) a focused effort to prepare and test zeolites with predominantly Lewis acidity. In our general exploration, we looked at such diverse materials as chabazites, mordenites, pentasils, SAPOs, and ALPOs. Our work with Lewis acidity sought to exploit the structural advantages of zeolites without the interfering effects of deleterious Broensted sites. We used zeolite Ultrastable Y (USY) as our base material because it possesses a high proportion of Lewis acid sites. This work was extended by modifying the USY through ion exchange to try to neutralize residual Broensted acidity.

NTIS

Catalysts; Absorbents; Dehydration; Liquid Phases; Ethers; Methyl Alcohol

20020076116 Army Medical Service, Graduate School, Washington, DC USA

Mixture Component Effects on Passive Diffusion Monitor Performance

Frick, Gregory A.; Aug. 14, 2002; 77p; In English

Report No.(s): AD-A405093; C102-118; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The 21st century American military finds itself deploying throughout the world. In many cases, military members perform the same jobs they would at a home base, but using different facilities, materials, and equipment. As was evidenced by the Gulf War, military members in these conditions can be exposed to a wide variety of chemical hazards. Unfortunately, many of the current methods for quantifying these hazards are not applicable in deployed environments. Facilities may not exist to calibrate equipment properly, personnel expertise may not be available to operate the equipment, and lack of electricity sources can prevent utilization of the equipment. In these situations, an alternative is necessary to adequately characterize personnel exposures. One such alternative is diffusive samplers.

DTIC

Diffusion; Toxicity and Safety Hazard; Passivity; Industrial Safety

20020076123 SafetySCAN, LLC, Buffalo, NY USA

Invisible Flame Imaging

Spinoff 1997; 1997, pp. 66-67; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Stennis Space Center uses more than one million gallons of liquid hydrogen per month in its rocket testing program. Firefighters responding to a hydrogen fire had to give the area ”the broom test” to determine the presence and location of a fire. This technique has significant safety and accuracy shortfalls. Stennis then developed technology to visually assess the presence, location and extent of hydrogen fires. SafetyScan, LLC. is now manufacturing FIRESCAPE, the first affordable commercial product for invisible (or ashless) fire imaging based on the original technology, to aid firefighters in seeing the invisible flames from alcohol and hydrogen fires during the day and even through smoke. The hand-held device weighs five pounds, is used like a pair of binoculars and can run for up to two hours before recharging.

Author

Fires; Flames; Imaging Techniques; Liquid Hydrogen; Safety

20020076183 National Energy Technology Lab., Pittsburgh, PA USA

Optimization of char for nox removal

Phillips, J.; Radovic, L. R.; Xia, B.; Menendez, J. A.; Sep. 01, 1999; 121p; In English

Report No.(s): DE2001-796859; FG22-95PC95225--04; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Work performed for this study demonstrates that the temperature of treatment and the identity of the treatment gas both strongly impact the surface chemistry of activated carbon. Two commercial activated carbons were treated in either N(sub 2) or H(sub 2) at different temperatures up to 2600 C. Several techniques--including microcalorimetry, point of zero charge measurements, thermal desorption--were used to provide insight into important aspects of the chemical surface properties. The results show that activated carbons treated at high temperatures (ca. 950 C) in hydrogen will not react with oxygen and water at ambient temperatures; moreover, surfaces created in this fashion have stable properties in ambient conditions for many months. In contrast, the same carbons treated in an inert gas (e.g., N(sub 2)) will react strongly with oxygen and water at ambient

temperatures. In the presence of platinum (or any other noble metal), stable basic carbons, which will not adsorb oxygen in ambient laboratory conditions, can be created via a relatively low-temperature process. Treatment at higher temperatures produced increasingly stable surfaces in either N(sub 2) or H(sub 2). A structural model is proposed. to wit: Treatment at high temperatures in any gas will lead to the desorption of oxygen surface functionalities in the form of CO and/or CO(sub 2). Absent any atom rearrangement, the desorption of these species will leave highly unsaturated carbon atoms ('dangling carbons') on the surface, which can easily adsorb O(sub 2) and H(sub 2)O. In an inert gas these 'dangling carbons' will remain, but hydrogen treatments will remove these species and leave the surface with less energetic sites, which can only adsorb O(sub 2) at elevated temperatures. Specifically, hydrogen reacts with any highly unsaturated carbons in the surface to form methane. At temperatures greater than 1500 C (e.g., 1800 C, 2600 C), structural annealing takes place and the consequent growth in the size of graphene layers eliminates the highly energetic dangling carbon sites. The basicity of the surface originates from two types of Lewis base sites: the localized electron pairs at the edges of the graphene layers and the delocalized (pi) electrons on the basal planes. A hydrogen spillover mechanism was proposed here to explain the low-temperature process for the stable basic carbon. The role played by platinum (or any noble metal) is to produce atomic hydrogen, which spills over onto the carbon surface. This atomic hydrogen hydrogasifies the most reactive, unsaturated carbon atoms at far lower temperatures than molecular hydrogen, thus leading to surface stabilization at relatively low temperatures.
NTIS
Nitrogen Oxides; Charring; Chemical Reactions; Surface Reactions; Molecular Gases; High Temperature

20020076199 National Inst. of Justice, Office of Justice Programs, Washington, DC USA
Evaluation of a Test Protocol for Explosives Trace Detectors Using a Representative Commercial Analyzer
2002; 42p
Report No.(s): PB2002-109025; NIJ-100-99; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The Office of Law Enforcement Standards (OLES) of the National Institute of Standards and Technology (NIST) furnishes technical support to the National Institute of Justice (NIJ) program to strengthen law enforcement and criminal justice in the USA. OLES's function is to conduct research that will assist law enforcement and criminal justice agencies in the selection and procurement of quality equipment. OLES is: (1) Subjecting existing equipment to laboratory testing and evaluation, and (2) conducting research leading to the development of several series of documents, including national standards, user guides, and technical reports. This document covers research conducted by OLES under the sponsorship of the National Institute of Justice. Additional reports as well as other documents are being issued under the OLES program.
NTIS
Explosives; Detectors; Analyzers; Law (Jurisprudence)

20020076295 Cincinnati Univ., Dept. of Chemical Engineering, OH USA
Novel Ceramic Membrane for High Temperature Carbon Dioxide Separation ***Annual Report, Mar. - Aug. 01***
Ida, J.; Yang, Z.; Lin, J. Y. S.; Sep. 2001; 18p; In English
Report No.(s): DE2002-788102; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Objective of this research program is to develop a dense, non-porous ceramic membrane for separation of carbon dioxide from flue gas at high temperatures (400-600 degrees C). The research has been focused on addressing several fundamental issues of lithium zirconate (Li2ZrO3). In the 2nd half research, we conducted various kinds of experiments to understand the CO2 sorption/desorption mechanism on the pure and modified Li2ZrO3 with the help of TGA, DSC-TGA and XRD. DSC-TGA results suggest that the melting of Li/K carbonates mixture may play an important role in rapid CO2 sorption in the case of modified lithium zirconate. The CO2 desorption experiments show that CO2 desorption from the modified lithium zirconate follows the same mechanism as that from the pure lithium zirconate. This is different from the CO2 adsorption on the pure and modified lithium zirconates.
NTIS
Carbon Dioxide; Ceramics; High Temperature; Thermogravimetry; Desorption; Membranes

20020076331 National Defence Research Establishment, Avedelningen foer NBC Skydd, Umea, Sweden
Mobile Alpha-Ray Spectrometry ***Mobil Alfaspektrometri***
Lidstroem, K.; Tjaernhage, A.; Jan. 2000; 28p; In Swedish
Report No.(s): PB2002-106827; FOA-R-00-01482-861-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The aim of this work was to investigate the possibilities of alpha-ray spectrometry in situ. This started from a theoretical study about the circumstances that measurements of alpha emitters rely on. Then, a prototype was built on a basis of a silicone surface barrier detector and portable electronic equipment. This equipment was used for experiments on five different samples with

different nuclide mixtures. Each sample was measured during two different conditions, in vacuum and in normal air pressure. The report describes the prototype and the results of the experiments made.
NTIS
Spectrometers; Atmospheric Pressure; Gas Pressure; Nuclides

20020076426 National Energy Technology Lab., Pittsburgh, PA USA
Development of mesoporous membrane materials for CO2 separation
Shih, W.-H.; Zhao, Q.; Wang, N.; May 01, 2002; 8p; In English
Report No.(s): DE2001-795760; FG26-00NT40823--01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Mesoporous and precipitated alumina were synthesized as the base material for CO2 adsorbent. The porous alumina is doped with Ba to enhance it CO2 affinity due to the basicity of Ba. It is shown by gas chromatograph (GC) that the addition of Ba enhances the separation CO2 from N2. It was found that mesoporous alumina has larger specific surface area and better selectivity of CO2 than precipitated alumina. Ba improves the affinity of mesoporous alumina with CO2. Phase may play an important role in selective adsorption of CO2. It is speculated that mesoporous alumina is more reactive than precipitated alumina creating the xBaO (center dot) Al2O3 phase that may be more affinity to CO2 than N2. On the other hand, the barium aluminate phase Ba3Al2O6 in the mesoporous sample does not help the adsorption of CO2.
NTIS
Separation; Membranes; Carbon Dioxide; Porous Materials; Aluminum Oxides; Precipitates

20020076465 ESDU International Ltd., London, UK
Viscosity of liquids: aliphatic nitriles
May 2002; In English; Available from ESDU International as part of the ESDU Series on Physical Data, Chemical Engineering.
Report No.(s): ESDU-02001; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 02001 tabulates the dynamic viscosity of 18 aliphatic nitriles at saturation pressure for temperatures from just above the melting point to approximately 0.9 of the critical temperature. The 18 nitriles comprise 17 alkanonitriles and one alkenonitrile. Experimental data extracted from the literature were fitted by an equation for the logarithm of dynamic viscosity as a function of reduced temperature. The equation contains four constants and the values determined for them are tabulated for each compound. The constants were chosen in such a way that their values varied progressively throughout the chemical series and, simultaneously, provided acceptable fits to any reliable data. Viscosities are tabulated at 10 K and 10 degree Celsius intervals, together with an assessment of the uncertainty in each value. The sources of data for each compound are listed, and the critical temperature is given. It is noted that the viscosity increases by 1 per cent for a pressure increase of 10 bar, and an equation is suggested for calculating the effect of pressure up to 500 bar.
ESDU
Nitriles; Viscosity; Alkanes; Alkenes

20020076466 ESDU International Ltd., London, UK
Thermal conductivity of liquid aromatic compounds containing oxygen
May 2002; In English; Available from ESDU International as part of the ESDU Series on Physical Data, Chemical Engineering.
Report No.(s): ESDU-02002; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 02002 contains tabulated data for eleven aromatic alcohols, three aromatic chlorophenols, three aromatic ethers, twelve aromatic esters, benzaldhyde and acetophenone. Experimental results drawn from the literature for each pure compound were fitted with a four-term polynomial equation in reduced temperature. The coefficients were also faired with changing molecular structure to ensure that the best correlation not only for the individual compounds but also for them as members of their chemical series. The coefficient correlations also allowed values to be predicted for pure compounds for which no measured data exist. The equations were used to tabulate thermal conductivity values from close to the melting point to about 0.9 of the critical temperature in SI units at 10 K and 10 degree Celsius intervals. The likely uncertainties in the values presented are indicated in the text. The critical temperature, coefficients and sources of the data are given for each compound. The effect of pressure is briefly considered.
ESDU
Esters; Ethers; Ketones; Oxygen; Polynomials; Thermal Conductivity; Aromatic Compounds; Phenols

26
METALS AND METALLIC MATERIALS

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

20020074374 Naval Postgraduate School, Monterey, CA USA
Experimental Studies of Noise/Vibration Damping for Undersea Warfare Applications
Cahill, John J.; Jun. 2002; 75p; In English; Original contains color images
Report No.(s): AD-A404768; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Maintaining silence underwater is an important issue with undersea warfare, One technique to reduce noise radiation is to use a passive noise/vibration material. The objective of this research was to investigate the vibration properties of an aluminum foam with various types of damping treatment. The importance of the determination of the damping properties of the aluminum foam and various damping treatments was for the future development of materials that would reduce the radiated noise of undersea weapons and onboard machinery. The frequency response was determined using three tests; swept sine, impact hammer, and random noise. The natural frequencies were determined by examining the Nyquist plot of the frequency response. The damping ratios were determined by using the half-power point method.
DTIC
Metal Foams; Noise Reduction; Vibration Damping

20020074824 Universal Technology Corp., Dayton, OH USA
Effects of Compressive Stress on Fluorescent Penetrant Indications of Fatigue Cracks in Titanium ***Final Report, 1 Oct. 1998-31 Mar. 2001***
Brausch, John C.; Tracy, Noel A.; Mar. 2001; 37p; In English; Original contains color images
Contract(s)/Grant(s): F33615-97-C-5640; Proj-4349
Report No.(s): AD-A404873; UTC-S435-778; AFRL-ML-WP-TR-2001-4139; No Copyright; Avail: CASI; A03, Hardcopy

Although it has been generally accepted that compressive stress adversely affects the fluorescent penetrant indications of fatigue cracks, published supporting data was lacking. to begin to fill this data void, five titanium specimens containing low cycle fatigue cracks were repetitively processed with a standardized liquid penetrant procedure after known stresses had been applied. A fixture was designed to apply known amounts of compressive stress on the cracked surfaces over the range of 0 to 63.5 ksi. The penetrant indications were measured and analyzed with two independent techniques. Eddy current inspection data were also generated for comparison with the penetrant data. The liquid penetrant indications began to diminish immediately with the application of compressive stress. On the other hand, the amplitudes of the eddy current indications remained the same over the entire range of applied stress.
DTIC
Crack Propagation; Titanium; Stresses; Compressibility; Fatigue (Materials); Fluorescence; Penetrants

20020074879 California Univ., Dept. of Materials Science and Engineering, Berkeley, CA USA
High-Cycle Fatigue and Time-Dependent Failure in Metallic Alloys for Propulsion Systems ***Final Report, 1 Sep. 1996-31 Mar. 2002***
Ritchie, R. O.; Suresh, S.; Hutchinson, J. W.; Milligan, W. W.; May 01, 2002; 521p; In English
Contract(s)/Grant(s): AFOSR-F49620-96-1-0478
Report No.(s): AD-A405144; AFRL-SR-AR-TR-02-0245; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche

The objective of the AFOSR-Multidisciplinary Research Initiative on High-Cycle Fatigue has been to characterize and performed physically-based modeling of the limiting damage states at the onset of high-cycle fatigue failure in blade and disk components in gas-turbine aircraft engines. The intent has been to facilitate mechanistic understanding as a basis for improved life prediction of such engine components. Efforts were focused on defining: (1) the fatigue thresholds for high-cycle fatigue, specifically involving small crack and mixed-mode effects, and (2) the influence of foreign object damage (FOD) on such thresholds and on the subsequent life, and the role of fretting and fretting fatigue, in a Ti-6Al-4V blade alloy and a polycrystalline Ni-base disk alloy.
DTIC
Nickel Alloys; Titanium Alloys; Propulsion System Performance

20020075675 Argonne National Lab., IL USA

Properties of 20% cold-worked 316 stainless steel irradiated at low dose rate.

Allen, T. R.; Tsai, H.; Cole, J. I.; Ohta, J.; Dohi, K.; Jun. 05, 2002; 14p; In English

Report No.(s): DE2001-795834; ANL/NT/CP-107886; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

To assess the effects of long-term, low-dose-rate neutron exposure, tensile, hardness, and fracture properties were measured and microstructural characterization performed on irradiated 20% cold-worked Type 316 stainless steel. Samples were prepared from reactor core components retrieved from the EBR-II reactor following final shutdown. Sample locations were chosen to cover a dose range of 1-56 dpa at temperatures from 371-390 C and dose rates from 0.8-3.3 x 10(sup -7) dpa/s. Irradiation caused hardening, with the ultimate tensile strength (UTS) reaching about 800 MPa near 20 dpa and appearing to saturate at higher doses. The yield strength (YS) follows approximately the same trend as the ultimate tensile strength. At higher dose, the difference between the UTS and YS decreases, suggesting the work-hardening capability of the material is decreasing with increasing dose. The hardness and yield strength increases occur roughly over the same range of dose. While the material retained respectable ductility at 20 dpa, the uniform and total elongation decreased to <1 and <3%, respectively, at 47 dpa. Fracture in the 30 dpa specimen is mainly ductile but with local regions of mixed-mode failure, consisting mainly of dimples and microvoids. The fracture surface of the higher-exposure 47 dpa specimen displays more brittle features. Changes in yield strength predicted from the microstructural components are roughly consistent with the measured changes in yield strength.

NTIS

Dosage; Irradiation; Cold Working; Stainless Steels

20020075722 Ufa State Technical Aviation Univ., Inst. of Physics of Advanced Materials, Russia

Nanostructures and Enhanced Properties in Tungsten and its Alloys Processed by Equal Channel Angular Pressing ***Final Report, 11 Jan.-10 Jun. 2002***

Valiev, R. Z.; Alexandrov, I. V.; Jun. 10, 2002; 22p; In English

Contract(s)/Grant(s): N68171-01-M-5641

Report No.(s): AD-A405186; R/D-9135-MS-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of the present project has been the development of the ECAP (Equal Channel Angular Pressing) technique for processing of UFG (Ultrafine Grained) structures in tungsten (W) and W(4.3%)Ni(2%)Fe alloy, which refer to very low ductility and hard-to-deform materials. Taking into account the computer simulation results of ECAP there has been conducted a modernization of the die-set, aimed at decreasing the pressing temperature below 1000 deg C at the cost of a decrease in the intensity of deformation for one pass and a use of backpressure. The influence of the number of passes, the rate and the pressing route on the UFG structure formation has been investigated. There has been shown the possibility to obtain the UFG structure with a grain size about 0.5 micrometers in W by optimizing the ECAP regimes. A formation of such small grains leads to a strength enhancement. At the same time manifestations of the viscous character of the UFG W fracture points out at a principal change in its ductile properties. A strong microstructure refinement after several passes of ECAP has been achieved also in the W heavy alloys with a low workability. There have been outlined ways for a further progress in ECAP of W, leading to a formation of a homogeneous UFG structure in bulk billets, which provides extraordinary mechanical properties.

DTIC

Finite Element Method; Alloys; Tungsten; Grain Boundaries; Nanostructure (Characteristics); Stress-Strain Relationships

20020075971 Argonne National Lab., IL USA

Non-destructive metallurgical analysis of astrolabes utilizing synchrotron radiation.

Newbury, B.; Stephenson, B.; Almer, J. D.; Notis, M.; Haeffner, D. R.; May 22, 2002; 7p; In English

Report No.(s): DE2001-795810; ANL/XFD/CP-107739; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

From the experiments performed it is possible to determine a wide range of information about the metallurgy of the astrolabes studied. It was found that different brass alloys were used for components that were cast and those that were mechanically deformed. Chemical composition, forming history, and thickness measurements are all determined non-destructively, illustrating that this technique could be useful for many applications with metal artifact analysis where non-intrusive methods are required.

NTIS

Metallurgy; Microanalysis; Nonintrusive Measurement; Chemical Composition; Brasses

20020076087 Department of Energy, Office of Environmental Management, Washington, DC USA

Innovative Technology Summary Report: The NITON (registered) XL-800 Series Multi-Element Spectrum Analyzer (Alloy Analyzer). Deactivation and Decommissioning Focus Area

Apr. 2000; 44p; In English

Report No.(s): DE2002-769190; DOE/EM-0530; No Copyright; Avail: Department of Energy Information Bridge

The NITON(Trademark) 800 series analyzer is a hand-held, battery operated unit that measures 8-in x 3-in x 2-in and weighs 2.5 pounds. The analyzer uses x-ray fluorescence spectrum analysis to identify and quantify elements in metal and then compares the readings to a built-in library to determine a metal's alloy. The library contains 300 elements and alloys, and can be customized to identify other elements and alloys (depending on the sources in the instrument). The basic unit utilizes a Cadmium-109 source, but each analyzer unit can hold up to two sources. These sources include Iron-55 and Americium-241. Pushing a safety button located on the side of the unit and placing it against a surface opens the shutter window. Within seconds the unit beeps, and displays the results. The analyzer stores up to 1,000 data sets, including sample identification codes using a barcode reader. The data is easily downloaded to a conventional computer when sampling has been completed. Batteries are good for 8-hrs and charge in less than 2 hours and it can be carried, shipped, or transported without exterior labeling, conforming to 49 CFR 143.421.

NTIS

Alloys; Spectrum Analysis; Steels; Actinide Series

20020076156 Memry Corp., Brookfield, CT USA

Memory Golf Clubs

Spinoff 1997; 1997, pp. 80; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Memory Corporation's investigation of shape memory effect, stemming from Marshall Space Flight Center contracts to study materials for the space station, has aided in the development of Zeemet, a proprietary, high-damping shape memory alloy for the golf industry. The Nicklaus Golf Company has created a new line of golf clubs using Zeemet inserts. Its superelastic and high damping attributes translate into more spin on the ball, greater control, and a solid feel.

Author

Shape Memory Alloys; Product Development; Balls

20020076203 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

New support structure for high field magnets

Bish, P. S.; Caspi, S.; Dietderich, D. R.; Gourlay, S. A.; Hafalia, R. R.; Jun. 15, 2001; 4p; In English

Report No.(s): DE2001-795954; LBNL--47796; SC-MAG 738; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Pre-stress of superconducting magnets can be applied directly through the magnet yoke structure. We have replaced the collar functionality in our 14 Tesla R and D Nb(sub 3)Sn dipole magnets with an assembly procedure based on an aluminum shell and bladders. Bladders, placed between the coil pack and surrounding yoke inside the shell, are pressurized up to 10 ksi (70 MPa) to create an interference gap. Keys placed into the interference gap replace the bladder functionality. Following the assembly, the bladders are deflated and removed. Strain gauges mounted directly on the shell are used to monitor the stress of the entire magnet structure, thereby providing a high degree of pre-stress control without the need for high tolerances. During assembly, a force of 8.2 x 10(sup 5) lbs/ft (12 MN/m) is generated by the bladders and the stress in the 1.57 inch (40mm) aluminum shell reaches 20.3 ksi (140 MPa). During cool-down the thermal expansion difference between shell and yoke generates an additional compressive force of 6.85 x 10(sup 5) lbs/ft (10 MN/m), corresponding to a final stress in the shell of 39.2 ksi (270 MPa). Pre-stress conditions are sufficient for 16 T before the coils separate at the bore. Bladders have now been used in the assembly and disassembly of two 14 T magnets. This paper describes the magnet structure, assembly procedure and test results.

NTIS

Dipoles; Superconducting Magnets; Monitors; High Field Magnets; Aluminum

20020076266 Cornell Univ., Ithaca, NY USA

A Multiscale Modeling Approach to Crack Initiation in Aluminum Polycrystals

Ingraffea, Anthony R., Cornell Univ., USA; Iesulauro, E., Cornell Univ., USA; Cretegny, T., Cornell Univ., USA; Chen, C.-S., Cornell Univ., USA; Dodhia, K., Cornell Univ., USA; Myers, C., Cornell Univ., USA; Sethna, J., Cornell Univ., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 201-221; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

A current issue facing our aging fleet of commercial and military aircraft is what is the residual strength of comments, such as fuselage and wing skins, after undergoing damage such as corrosion and fatigue crack initiation. Corrosion and fatigue crack initiation are inherently multiscale problems. The following discusses why we are looking at fatigue crack initiation and tools developed to study how fatigue cracks initiate and begin to propagate. These tools have been developed to study 2D representations of metallic polycrystals at the mesoscale that can then be used as part of a multiscale simulation involving continuum as well as atomics models. Recent work has involved transitioning these tools to 3D.
Author
Airframes; Residual Strength; Corrosion; Crack Initiation; Fatigue (Materials); Computerized Simulation; Polycrystals

20020076268 Pennsylvania Univ., Dept. of Materials Science and Engineering, Philadelphia, PA USA
Yield Criteria for BCC Metals that Include Effects of Non-Glide Stresses Based on Understanding the Atomic Level Features of Dislocation Motion
Vitek, Vaclav, Pennsylvania Univ., USA; Bassani, J. L., Pennsylvania Univ., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 241-268; In English; Also announced as 20020076258; Original contains color illustrations
Contract(s)/Grant(s): NSF CMS-99-00131; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche
The criterion for the activation of a slip system alpha is that a yield function reaches a critical value. This function depends, in general, on the whole tensor of the applied stress and crystallography of the material studied.
Derived from text
Yield; Dislocations (Materials); Plastic Flow; Plastic Deformation; Metals; Body Centered Cubic Lattices

20020076269 California Univ., San Diego, La Jolla, CA USA
Multiscale Modeling of Crystalline Metals with Experimental Verification
Nemet-Nasser, Sia, California Univ., San Diego, USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 269-297; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche
Strain gradient exists at all scales: around dislocation lines; near slip planes; within each crystal; over many crystals and at continuum scale around geometric and material discontinuities. Strain fields are obtained by solving initial boundary-value problems at relevant length scale. Constitutive relations must reflect essential structural characteristics at relevant length scales. Dislocation density provides a natural length scale in continuum plasticity.
Derived from text
Plastic Properties; Dislocations (Materials); Metal Crystals; Microstructure; Computerized Simulation; Mathematical Models

20020076296 Tennessee Univ., Dept. of Materials Science and Engineering, Knoxville, TN USA
Systematic Microstructural and Corrosion Performance Evaluation of CK-3MCuN & CN-3MN High Molybdenum Stainless Steel Castings ***Final Report***
Lundin, C. D.; Wen, S.; Liu, W.; Zhou, G.; Oct. 2001; 226p; In English
Report No.(s): DE2002-793155; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
High molybdenum austenitic stainless steel castings are widely accepted for their high strength, excellent weldability, and good corrosion resistance over a wide range of temperatures in highly oxidizing aqueous and gaseous media in chemical processing and other environments. With their desirable performance, high molybdenum austenitic stainless steel castings are increasingly applied in industry in a similar manner as wrought materials. In general, cast and wrought stainless and high alloy steels are anticipated to possess equivalent resistance to corrosive media, and they are frequently used in conjunction with each other. However, alloying element segregation usually is more evident in castings than in wrought counterparts. Segregation of alloying elements can lead to the formation of secondary phases, such as sigma. Mechanical properties and especially the corrosion resistance of castings may be affected by the secondary phases. In addition, improper heat treatment procedures c an also lead to the formation of carbides and secondary phases in high alloy and austenitic stainless steels.
NTIS
Corrosion Resistance; Molybdenum; Casting; Austenitic Stainless Steels; Heat Treatment

20020076297 Worcester Polytechnic Inst., MA USA
Casting Characteristics of Aluminum Die Casting Alloys ***Final Report***
Apelian, D.; Makhlouf, M. M.; Feb. 05, 2002; 50p; In English
Report No.(s): DE2002-792701; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The research program investigates the casting characteristics of selected aluminum die casting alloys. Specifically, the alloys' tendencies towards die soldering and sludge formation, and the alloys' fluidity and machinability are evaluated. It was found that: When the Fe and Mn contents of the alloy are low; caution has to be taken against possible die soldering. When the alloy has a high sludge factor, particularly a high level of Fe, measures must be taken to prevent the formation of large hardspots. For this kind of alloy, the Fe content should be kept at its lowest allowable level and the Mn content should be at its highest possible level. If there are problems in die filling, measures other than changing the alloy chemistry need to be considered first. In terms of alloy chemistry, the elements that form high temperature compounds must be kept at their lowest allowable levels. The alloys should not have machining problems when appropriate machining techniques and machining parameters are used.
NTIS
Aluminum Alloys; Manganese Alloys; Machining; Cast Alloys; Casting

20020076321 Helsinki Univ. of Technology, Dept. of Materials Science and Rock Engineering, Espoo, Finland
Thermodynamic Description of Systems Cu-Al-Sn, Cu-Al-Zn and Cu-Sn-Zn in the Copper=Rich corner of the Systems
Miettinen, J.; 2000; 60p; In English
Report No.(s): PB2002-105659; TKK-MK-116; Copyright; Avail: National Technical Information Service (NTIS)
Thermodynamic optimization of systems Cu-Al-Sn, Cu-Al-Zn and Cu-Sn-Zn is made by using classical thermodynamic models for describing the properties of the individual phases of these systems. The optimization is limited to the copper-rich corner of the systems the gamma phase of systems Cu-Al, Cu-Sn and Cu-Zn being the remotest phase included in the analysis. The data for the pure components and for the binary systems are taken from the earlier assessed, SGTE-compatible descriptions, though slight reoptimization of the data is first made for the bcc and fcc phases of the system. Next, new thermodynamic data are optimized for the ternary systems and tentatively, also for the quaternary Cu-Al-Sn-Zn system. The experimental data applied in the optimization are based on the measurements of phase equilibria and various thermodynamic properties obtained from the literature. The results of the optimization are presented by comparing the original, experimental data with the calculations of the present and the earlier studies. Better agreement is obtained by the present calculations through this is due to the smaller validity region (in composition) for the present assessments.
NTIS
Thermodynamic Properties; Copper Alloys; Binary Systems (Materials); Aluminum Alloys; Zinc Alloys

20020076354 Swedish Inst. for Metals Research, Stockholm, Sweden
Review of Pulse Plating: Electrodeposition of Metallic/Alloy Coatings. Includes an Experimental Study of Ni-Cu Multilayer Deposits
Palmqvist, U.; 2001; 68p; In English
Report No.(s): PB2002-105898; IM-2001-037; Copyright; Avail: National Technical Information Service (NTIS)
All metals are actually artificial and unstable materials (except gold and copper, which exists as metals in nature). Often are metals, for reasons of cost, strength and the process manufactured without too much regard to the external appearance and the corrosion resistance. The surface characteristics are then treated in subsequent processes. The main reason with the surface treatment is to improve the appearance and to improve corrosion resistance, hardness, wear resistance and other surface properties. The surface layer has to be thin otherwise the characteristics of the sample are changed. The type of surface treatment is often a matter of cost, the environment it has to withstand and the appearance necessary. Coatings can be applied by several different techniques, for example, hot-dipping, metal spraying, deposition in vacuum (physical vapor deposition (PVD) and chemical vapor deposition (CVD)) and electroplating. The electrodeposition can offer a relatively cheap and a quite industrialized production method.
NTIS
Electrodeposition; Coatings; Plating; Pulses; Metals

20020076355 Swedish Inst. for Metals Research, Stockholm, Sweden
Super Fine-Grained Steels
Siwecki, T.; 2001; 34p; In English
Report No.(s): PB2002-105897; IM-2001-029; Copyright; Avail: National Technical Information Service (NTIS)
The project aims to present the new methods for obtaining ultra-fine microstructures in HSLA steel. In this literature review, attention is given to various technical developments of steel processing, chemistry and manufacturing methods of high strength steel for plate and strips with very fine structures. The new ideas for refinement of microstructure of HSLA steels, which have been developed recently around the world, are discussed. Heavy reduction at low temperatures, especially in the two-phase region, can give a very fine-grained structure with 0.5-2 um size of ferrite grains. These steels are characterized by high strength and high

toughness. In the steel making process, new treatments have been developed for inclusion-precipitate control in austenite and refinement of the final microstructure during transformation. Excellent toughness even for heavy plates can be obtained in such treated steel.
NTIS
Microstructure; Technology Assessment; High Strength Steels; Manufacturing

20020076356 Swedish Inst. for Metals Research, Stockholm, Sweden
Applications of Acoustic Emission in Corrosion Research: A Literature Survey
Jargelius-Pettersson, R. F. A.; 2001; 44p; In English
Report No.(s): PB2002-105896; IM-2001-017; Copyright; Avail: National Technical Information Service (NTIS)
A literature survey has been performed on applications of the acoustic emission technique in corrosion research on metallic materials. The main emphasis is on applications to stainless steels and the majority fo examples are taken from this area. The background section describes basic physical principles and instrumentation, and also includes an overview of the use of AE in non-destructive testing and monitoring. The following literature survey on laboratory applications is not exhaustive, but instead concentrates on examples to illustrate both the methodologies which are employed and typical results obtained. This part of the survey is divided into four main sections covering pitting and crevice corrosion, stress corrosion cracking (including hydrogen embrittlement and corrosion fatigue), erosion-corrosion and high temperature corrosion.
NTIS
Metals; Stress Corrosion; Acoustic Emission; Literature

20020076385 Worcester Polytechnic Inst., MA USA
Clean Metal Casting *Final Report*
Makhlouf, M. M.; Apelian, D.; Feb. 05, 2002; 274p; In English
Report No.(s): DE2002-793152; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The objective of this project is to develop a technology for clean metal processing that is capable of consistently providing a metal cleanliness level that is fit for a given application. The program has five tasks: Development of melt cleanliness assessment technology, development of melt contamination avoidance technology, development of high temperature phase separation technology, establishment of a correlation between the level of melt cleanliness and as cast mechanical properties, and transfer of technology to the industrial sector. Within the context of the first task, WPI has developed a standardized Reduced Pressure Test that has been endorsed by AFS as a recommended practice. In addition, within the context of task1, WPI has developed a melt cleanliness sensor based on the principles of electromagnetic separation. An industrial partner is commercializing the sensor. Within the context of the second task, WPI has developed environmentally friendly fluxes that do not contain fluorine. Within the context of the third task, WPI modeled the process of rotary degassing and verified the model predictions with experimental data. This model may be used to optimize the performance of industrial rotary degassers. Within the context of the fourth task, WPI has correlated the level of melt cleanliness at various foundries, including a sand casting foundry, a permanent mold casting foundry, and a die casting foundry, to the casting process and the resultant mechanical properties. This is useful in tailoring the melt cleansing operations at foundries to the particular casting process and the desired properties of cast components.
NTIS
Casting; Aluminum Alloys; Correlation; Sand Casting

27
NONMETALLIC MATERIALS

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

20020074570 Cambridge Univ., Dept. of Physics, Cambridge UK
Shock Studies of Ceramics *Final Report, May-Aug. 2002*
Brar, N. S.; Proud, W. G.; Field, J. E.; Aug. 2002; 14p; In English
Contract(s)/Grant(s): N62558-02-M-5607
Report No.(s): AD-A404894; RG 35823; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The report covers the visit of Dr. N. S. Brar of the University of Dayton, USA to the Cavendish Laboratory. The project involved an exchange of ideas in the area of shock physics and the design, sample preparation and testing of various materials in the plate-impact facility. The report describes the plate impact facility and the techniques used. A phenomena of particular

interest is that of failure front propagation in brittle materials. This is failure by compression and shear rather than tension. It is an established phenomena for glasses, but its occurrence in ceramics needs further study. The study visit was valuable in developing collaboration between the University of Dayton and the Cavendish.
DTIC
Ceramics; Mechanical Shock; Failure Analysis

20020074619 NASA Ames Research Center, Moffett Field, CA USA
Low Speed PSP Testing in Production Wind Tunnels
Bell, James, NASA Ames Research Center, USA; Mehta, Rabi, NASA Ames Research Center, USA; Schairer, Ed, NASA Ames Research Center, USA; Hand, Larry, NASA Ames Research Center, USA; [1998]; 1p; In English; 6th Annual Pressure Sensitive Paint Workshop, 6-10 Oct. 1998, Unknown
Contract(s)/Grant(s): RTOP 519-20-22; No Copyright; Avail: Issuing Activity; Abstract Only

The brightness signal from a pressure-sensitive paint varies inversely with absolute pressure. Consequently high signal-to-noise ratios are required to resolve aerodynamic pressure fields at low speeds, where the pressure variation around an object might only be a few percent of the mean pressure. This requirement is unavoidable, and implies that care must be taken to minimize noise sources present in the measurement. This paper discusses and compares the main noise sources in low speed PSP testing using the ”classical” intensity-based single-luminophore technique. These are: temperature variation, model deformation, and lamp drift/paint degradation. Minimization of these error sources from the point of view of operation in production wind tunnels is discussed, with some examples from recent tests in NASA Ames facilities.
Author
Aerodynamics; Pressure Distribution; Pressure Sensitive Paints; Signal to Noise Ratios; Brightness

20020074785 NASA Glenn Research Center, Cleveland, OH USA
Characterization of C/SiC Ceramic Matrix Composites (CMCs) with Novel Interface Fiber Coatings
Petko, Jeanne F., QSS Group, Inc., USA; Kiser, J. Douglas, NASA Glenn Research Center, USA; [2002]; 14p; In English; National Space and Missile Materials Symposium (NSMMS), 24-28 Jun. 2002, Colorado Springs, CO, USA; Original contains color illustrations
Contract(s)/Grant(s): RTOP 708-73-25; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ceramic Matrix Composites (CMCs) are attractive candidate aerospace materials due to their high specific strength, low density and high temperature capabilities. The National Aeronautics and Space Administration (NASA) is pursuing the use of CMC components in advanced Reusable Launch Vehicle (RLV) propulsion applications. Carbon fiber-reinforced silicon carbide (C/SiC) is the primary material of interest for a variety of RLV propulsion applications. These composites consist of high-strength carbon fibers and a high modulus, oxidation resistant matrix. For RLV propulsion applications, environmental durability will be critical. Two types of carbon fibers were processed with both standard (pyrolytic carbon) and novel (multilayer and pseudoporous) types of interface coatings as part of a study investigating various combinations of constituents. The benefit of protecting the composites with a surface sealant was also investigated. The strengths, durability in oxidizing environments, and microstructures of these developmental composite materials are presented. The novel interface coatings and the surface sealant show promise for protecting the carbon fibers from the oxidizing environment.
Author
Carbon Fibers; Ceramic Matrix Composites; Silicon Carbides; Coatings; Mechanical Properties; Microstructure

20020075009 Naval Research Lab., Washington, DC USA
The Burning of a Thermoplastic Material Under a Forced-Flow Boundary Layer Flame
Ndubizu, Chuka C.; Ananth, Ramagopal; Tatem, Patricia A.; Jul. 31, 2002; 46p; In English; Original contains color images
Report No.(s): AD-A405194; NRL/MR/6180--02-8630; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents experimental results of the characterization of forced flow boundary layer burning of poly(methyl methacrylate) (PMMA) without water mist. Small samples (7.5 x 9.5 x 2.5 cm) of black PMMA were burnt at the exit of a wind tunnel at free stream velocities between 60 and 168 cm per s, in tests lasting between 2.5 min and 20 min. The results of the gas phase temperature mapping indicate that a stable flame is formed over the sample within a short time after ignition. The local surface regression rate is transient, decreasing with time near the leading edge and increasing with time downstream. For 60 less than U, , less than 168 cm per s, the time averaged regression rate in the leading section decreased by about a factor of two between 5 and 20-minute tests. The transient burning rate in the leading section is due to the presence of a valley formed in this section

as a result of non-uniform surface regression. On the other hand, the transient regression rate in the trailing section seems to be due mainly to in-depth solid heat conduction.
DTIC
Thermoplastic Resins; Flame Propagation; Boundary Layer Combustion

20020075674 Argonne National Lab., IL USA
Friction and wear performance of low-friction carbon coatings under oil lubrication.
Kovalchenko, A.; Ajayi, O. O.; Erdemir, A.; Fenske, G. R.; Dec. 11, 2001; 12p; In English
Report No.(s): DE2001-795815; ANL/ET/CP-105672; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Amorphous carbon coatings with very low friction properties were recently developed at Argonne National Laboratory. These coatings have shown good promise in mitigating excessive wear and scuffing problems associated with low-lubricity diesel fuels. to reduce the negative effect of sulfur and other lubricant additives in poisoning the after-treatment catalyst, a lubricant formulation with a low level of sulfur may be needed. Exclusion of proven sulfur-containing extreme pressure (EP) and antiwear additives from oils will require other measures to ensure durability of critical lubricated components. The low-friction carbon coating has the potential for such applications. In the present study, we evaluated the friction and wear attributes of three variations of the coating under a boundary lubrication regime. Tests were conducted with both synthetic and mineral oil lubricants using a ball-on-flat contact configuration in reciprocating sliding. Although the three variations of the coating provided modest reductions in friction coefficient, they all reduced wear substantially compared to an uncoated surface. The degradation mode of oxidative wear on the uncoated surface was replaced by a polishing wear mode on the coated surfaces.
NTIS
Carbon; Coatings; Friction; Amorphous Materials; Boundary Lubrication; Mineral Oils; Coefficient of Friction

20020076003 Argonne National Lab., IL USA
Near-frictionless carbon coatings for spark-ignited direct-injected fuel systems. Final report, January 2002.
Hershberger, J.; Ozturk, O.; Ajayi, O. O.; Woodford, J. B.; Erdemir, A.; Apr. 05, 2002; 92p; In English
Report No.(s): DE2001-795901; ANL/ET/RP-107306; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report describes an investigation by the Tribology Section of Argonne National Laboratory (ANL) into the use of near-frictionless carbon (NFC) coatings for spark-ignited, direct-injected (SIDI) engine fuel systems. Direct injection is being pursued in order to improve fuel efficiency and enhance control over, and flexibility of, spark-ignited engines. SIDI technology is being investigated by the Partnership for a New Generation of Vehicles (PNGV) as one route towards meeting both efficiency goals and more stringent emissions standards. Friction and wear of fuel injector and pump parts were identified as issues impeding adoption of SIDI by the OTT workshop on 'Research Needs Related to CIDI and SIDI Fuel Systems' and the resulting report, Research Needs Related to Fuel Injection Systems in CIDI and SIDI Engines. The following conclusions were reached: (1) Argonne's NFC coatings consistently reduced friction and wear in existing and reformulated gasolines. (2) Compared to three commercial DLC coatings, NFC provided the best friction reduction and protection from wear in gasoline and alternative fuels. (3) NFC was successfully deposited on production fuel injectors. (4) Customized wear tests were performed to simulate the operating environment of fuel injectors. (5) Industry standard lubricity test results were consistent with customized wear tests in showing the friction and wear reduction of NFC and the lubricity of fuels. (6) Failure of NFC coatings by tensile crack opening or spallation did not occur, and issues with adhesion to steel substrates were eliminated. (7) This work addressed several of the current research needs of the OAAT SIDI program, as defined by the OTT report Research Needs Related to Fuel Injection Systems in CIDI and SIDI Engines.
NTIS
Adhesion; Carbon; Coatings; Friction Reduction; Fuel Injection

20020076124 BSR Products, Inc., Mooresville, NC USA
Automotive Insulation
Spinoff 1997; 1997, pp. 64-65; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under a Space Act Agreement between Boeing North America and BSR Products, Space Shuttle Thermal Protection System (TPS) materials are now used to insulate race cars. BSR has created special TPS blanket insulation kits for use on autos that take part in NASCAR events, and other race cars through its nationwide catalog distribution system. Temperatures inside a race car's cockpit can soar to a sweltering 140 to 160 degrees, with the extreme heat coming through the engine firewall, transmission tunnel,

and floor. It is common for NASCAR drivers to endure blisters and burns due to the excessive heat. Tests on a car insulated with the TPS material showed a temperature drop of some 50 degrees in the driver's cockpit. BSR-TPS Products, Inc. now manufactures insulation kits for distribution to race car teams around the world.
Author
Thermal Protection; Insulation; Burns (Injuries); Fabrication

20020076129 Hi-Temp Insulation, Inc., Camarillo, CA USA
Reusable Surface Insulation
Spinoff 1997; 1997, pp. 58-59; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Advanced Flexible Reusable Surface Insulation, developed by Ames Research Center, protects the Space Shuttle from the searing heat that engulfs it on reentry into the Earth's atmosphere. Initially integrated into the Space Shuttle by Rockwell International, production was transferred to Hi-Temp Insulation Inc. in 1974. Over the years, Hi-Temp has created many new technologies to meet the requirements of the Space Shuttle program. This expertise is also used commercially, including insulation blankets to cover aircrafts parts, fire barrier material to protect aircraft engine cowlings and aircraft rescue fire fighter suits. A Fire Protection Division has also been established, offering the first suit designed exclusively by and for aircraft rescue fire fighters. Hi-Temp is a supplier to the Los Angeles City Fire Department as well as other major U.S. civil and military fire departments.
Author
Cowlings; Earth Atmosphere; Fire Prevention; Insulation; Rescue Operations

20020076157 Sun Coast Chemicals of Daytona, Inc., Flagler Beach, FL USA
Sporting Good Lubricants
Spinoff 1997; 1997, pp. 79; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Sun Coast Chemicals was originally contracted by Lockheed Martin Space Operations to formulate a spray lubricant free of environmental drawbacks for the Mobile Launch Platform used to haul the Space Shuttle from the Kennedy Space Center Vehicle Assembly Building to a launch pad. From this work, Sun Coast introduced Train Track Lubricant, Penetrating Spray Lube, and Biodegradable Hydraulic Fluid. Based on the original lubricant work, two more products have also been introduced. First, the X-1R Super Gun Cleaner and Lubricant protects guns from rust and corrosion caused by environmental conditions. Second, the X-1R Tackle Pack, endorsed by both fresh and saltwater guides and certain reel manufacturers, penetrates, cleans, reduces friction, lubricates, and provides extra protection against rust and corrosion.
Author
Biodegradability; Corrosion Prevention; Lubricants; Lubrication; Sprayers

20020076177 Argonne National Lab., IL USA
Development of nondestructive evaluation methods for ceramic coatings
Ellingson, W. A.; Deemer, C.; Sun, J. G.; Erdman, S.; Muliere, D.; Apr. 29, 2002; 7p; In English
Report No.(s): DE2001-795035; ANL/ET/CP-107527; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Various nondestructive evaluation (NDE) technologies are being developed to study the use of ceramic coatings on components in the hot-gas path of advanced low-emission gas-fired turbines. The types of ceramic coatings include thermal barrier coatings (TBCs) and environmental barrier coatings (EBCs). TBCs are under development for vanes, blades, and combustor liners to allow hotter gas-path temperatures, and EBCs are under development to reduce environmental damage to high-temperature components made of ceramic matrix composites. The NDE methods will be used to (a) provide data to assess the reliability of new coating application processes, (b) identify defective components that could cause unscheduled outages, (c) track growth rates of defects during component use in engines, and (d) allow rational judgment for replace/repair/re-use decisions regarding components. Advances in TBC application, both electron beam-physical vapor deposition (EB-PVD) and air plasma spraying (APS), are allowing higher temperatures in the hot-gas path. However, as TBCs become 'prime reliant' their condition at scheduled or unscheduled outages must be known. NDE methods are under development to assess the condition of the TBC for pre-spall conditions. EB-PVD test samples with up to 70 thermal cycles have been studied by a newly developed method involving polarized laser back-scatter NDE. Results suggest a correlation between the NDE laser data and the TBC/bond-coat topography. This finding is important because several theories directed toward understanding the pre-spall condition suggest that the topography in the thermally grown oxide layer changes significantly as a function of the number of thermal cycles. Tests have

also been conducted with this NDE method on APS TBCs. Results suggest that the pre-spall condition is detected for these coatings. One-sided, high-speed thermal imaging also has shown promise for NDE of APS coatings. Testing of SiC/SiC composites for combustor liners has demonstrated that environmental EBCs are required to reduce oxidation-induced recession rates. NDE technologies, primarily one-sided and through-thickness thermal imaging, are under development to detect delaminations and degradation of EBCs. Recent results have demonstrated that NDE thermal image data correctly detected pre-spall regions of a barium-strontium-alumino-silicate coating on melt-infiltrated SiC/SiC. The NDE data were verified with field test data from a combustor liner in a 4.5 MW(e) natural-gas-fired turbine. The shape of the spalled EBC region and the growth of the spalled EBC region after various engine run times were correlated with boroscope image data from field tests. An effort has recently been started to address NDE development for oxide/oxide ceramic composites with an EBC. We will discuss the NDE methods under development for TBCs, recent NDE test results from thermally cycled TBCs, NDE results from EBCs on SiC/SiC, and the new effort directed toward oxide/oxide materials.
NTIS
Ceramic Coatings; Ceramic Matrix Composites; Nondestructive Tests; Electron Beams; Turbine Engines

20020076265 Schrodinger, Inc., Portland, OR USA
Exploration in Accurate Atomistic, Coarse Grain and Mesoscopic Simulations of Structured Solutions
Shelley, John C., Schrodinger, Inc., USA; Shelley, Mee Y., Schrodinger, Inc., USA; Reeder, Bob C., Proctor and Gamble Co., USA; Crawford, Ray A., Proctor and Gamble Co., USA; Laidig, Bill D., Proctor and Gamble Co., USA; Bandyopadhyay, Sanjoy, Pennsylvania Univ., USA; Lopez, Carlos, Pennsylvania Univ., USA; Moore, Preston B., Pennsylvania Univ., USA; Nielson, Steve, Pennsylvania Univ., USA; Klein, Michael L., Pennsylvania Univ., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 173-199; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Cleaning solutions, LCDs, and biophysical systems all rely on structured solutions for key aspects of their behavior. Simulations have a useful role to play in examining, learning about, making predictions concerning, and utilizing these systems. Atomistic simulations can be fairly routine but even if enormous resources are used in such studies many important phenomena lie outside their range of applicability. As a result simplified models with dramatically higher computational efficiencies have been used for many such studies. Generally, such approaches have used generalized models that do not correspond well to specific systems. Here we describe largely successful attempts at creating models with mimic specific systems fairly well.
Author
Computerized Simulation; Aqueous Solutions

20020076272 Delaware Univ., Dept. of Chemical Engineering, Newark, DE USA
Multiscale Modeling for Linking Growth, Microstructure, and Properties of Inorganic Microporous Films
Vlachos, Dion G., Delaware Univ., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 343-370; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The focus of this presentation is on multiscale modeling in order to link processing, microstructure, and properties of materials. Overview of problems we study includes: Growth mechanisms in chemical and physical vapor epitaxy; thin films of zeolites for separation and sensing; thin Pd films for hydrogen separation and pattern formation by self-regulation routes.
Derived from text
Computerized Simulation; Scale (Ratio); Microstructure; Microporosity

20020076283 National Inst. of Standards and Technology, Gaithersburg, MD USA
Bridging the Gap Between Structure and Properties in Nano-Particle Filled Polymers
Hobbie, E.; Douglas, J.; Starr, F.; Han, C.; Jul. 2002; 150p
Report No.(s): PB2002-107939; NISTIR-6893; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

On May 29-30 of 2002, a workshop on polymer nanocomposites was held at NIST in Gaithersburg, Maryland. The workshop was entitled Bridging the Gap Between Structure and Properties in Nanoparticle-Filled Polymers and focused primarily on the interrelation between particle dispersion and the properties of polymers filled with clay and nanotube fillers. The purpose of the workshop was to identify research topics for NIST research and to initiate research collaboration with industrial and academic researchers in this important technological area. The workshop participants included a diverse mix of industrial, government and

academic researchers. This document reproduces the slides presented by the speakers of this workshop along with a few introductory remarks about each contribution.
NTIS
Composite Materials; Polymer Matrix Composites; Nanocomposites

20020076342 Environmental Protection Agency, Research Triangle Park, NC USA
Reducing Emissions in Fiberglass Reinforced Plastics Manufacuring
Ramsey, G. H.; Nunez, C. M.; Kong, E.; Bahner, M.; Wright, R.; 2002; 10p
Report No.(s): PB2002-107529; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The paper summarizes results of an evaluation of pollution prevention techniques, so that technical assistance providers can provide better information to fiber-reinforced plastics and composites (FRP/C) facilities about pollution prevention options. It gives background about the industry, describes goals of this research, summarizes the testing program, and provides some key preliminary research, summarizes the testing program, and provides some key preliminary results and conclusions from the research. Pollution prevention techniques may help FRP/C companies substantially reduce their styrene emissions. However, information is needed about the percentage reduction in emissions that pollution prevention approaches can achieve. to meet this need, EPA determined baseline emissions and evaluated reductions in styrene emissions that can be achieved through a variety of pollution prevention approaches for the FRP/C industry.
NTIS
Air Pollution; Pollution Monitoring; Manufacturing; Pollution Control; Plastics; Fiber Composites

20020076372 US Chemical Safety and Hazard Investigation Board, Washington, DC USA
Investigation Report: Thermal Decomposition Incident: BP Amoco Polymers, Inc., Augusta, Georgia, on March 13, 2001
Jun. 2002; 104p; In English
Report No.(s): PB2002-107365; REPT-2001-03-I-GA; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This investigation report examines the thermal decomposition incident that occurred on March 13, 2001, at the BP Amoco Polymers, Inc., plant in Augusta, Georgia. Three workers were killed. This report identifies the root and contributing causes of the incident and makes recommendations for recognizing reactive hazards, learning from near-miss incidents, and opening process equipment. The U.S. Chemical Safety and Hazard Investigation Board (CSB) is an independent Federal agency whose mission is to ensure the safety of workers and the public by preventing or minimizing the effects of chemical incidents. CSB is a scientific investigative organization; it is not an enforcement or regulatory body. Established by the Clean Air Act Amendments of 1990, CSB is responsible for determining the root and contributing causes of accidents, issuing safety recommendations, studying chemical safety issues, and evaluating the effectiveness of other government agencies involved in chemical safety. No part of the conclusions, findings, or recommendations of CSB relating to any chemical incident may be admitted as evidence or used in any action or suit for damages arising out of any matter mentioned in an investigation report. CSB makes public its actions and decisions through investigation reports, summary reports, safety bulletins, safety recommendations, special technical publications, and statistical reviews.
NTIS
Thermal Decomposition; Health; Conducting Polymers; Safety Management

20020076414 National Energy Technology Lab., Pittsburgh, PA USA
Ceramic membrane enabling technology for improved igcc efficiency
Prasad, R.; Apr. 01, 2000; 9p; In English
Report No.(s): DE2001-795781; FC26-99FT40437--02; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this program is to conduct a technology development program to advance the state-of-the-art in ceramic Oxygen Transport Membranes (OTM) to the level required to produce step change improvements in process economics, efficiency, and environmental benefits for commercial IGCC (Integrated Gassification Combined Cycle) systems and other applications. The IGCC program is focused on addressing key issues in materials, processing, manufacturing, engineering and system development that will make the OTM a commercial reality. The objective of the OTM materials development task is to identify a suitable material that can be formed into a thin film to produce the target oxygen flux. This requires that the material have an adequate permeation rate, and thermo-mechanical and thermo-chemical properties such that the material is able to be supported on the desired substrate and sufficient mechanical strength to survive the stresses involved in operation. The objective of the composite OTM development task is to develop the architecture and fabrication techniques necessary to construct stable, high performance, thin film OTMs supported on suitable porous, load bearing substrates. The objective of the process

development task of this program to demonstrate the program objectives on a single OTM tube under test conditions simulating those of the optimum process cycle for the power plant.
NTIS
Ceramics; Gas Transport; Membrane Structures; Coal Gasification; Combined Cycle Power Generation

20020076415 National Energy Technology Lab., Pittsburgh, PA USA
Ceramic membrane enabling technology for improved igcc efficiency
Prasad, R.; Aug. 01, 2001; 6p; In English
Report No.(s): DE2001-795784; FC26-99FT40437--08; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objectives of the second year of the program are to define a material composition and composite architecture that enable the oxygen flux and stability targets to be obtained in high-pressure flux tests. Composite technology will be developed to enable the production of high-quality, defect free membranes of a thickness that allows the oxygen flux target to be obtained. The fabrication technology will be scaled up to produce three feet composite tubes with the desired leak rate. A laboratory scale, multi-tube pilot reactor will be designed and constructed to produce oxygen. In the third quarter of the second year of the program, work has focused on materials optimization, composite and manufacturing development and oxygen flux testing at high pressures. This work has led to several major achievements, summarized by the following statements: Oxygen has been produced under conditions similar to IGCC operation using composite OTM elements at a flux greater than the 2001 target. Under conditions with a greater driving force the commercial target flux has been met. Methods to significantly increase the oxygen flux without compromise to its mechanical integrity have been identified. Composite OTM elements have demonstrated stable operation at (Delta)P > 250 psi. Design of the pilot plant is complete and construction will begin next quarter.
NTIS
Ceramics; Membrane Structures; Coal Gasification; Oxygen; Gas Transport

20020076417 National Energy Technology Lab., Pittsburgh, PA USA
Development of mesoporous membrane materials for CO2 separation
Shih, W.-H.; Zhao, Q.; Patil, T.; May 01, 2002; 7p; In English
Report No.(s): DE2001-795762; FG26-00NT40823--02; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The authors propose to use microporous silica as a suitable candidate for CO2/N2 separation because the pore size is less than 10 (angstrom). If a CO2 adsorbent is added to the microporous silica, the adsorption of CO2 can block the passage of N2 and an effective CO2/N2 separator will be found. It was first demonstrated that microporous silica could be synthesized. The microporous silica was then impregnated with Ba(OH)2. The results of GC study showed that at temperatures between 50C and 90C, Ba-doped microporous silica can separate CO2 from N2 and the idea of a microporous membrane for CO2/N2 separation is feasible. The new result gives strong support to the proposed research that was outlined in the Phase II proposal. They hope to be able to continue the research and build an effective CO2/N2 membrane separator in the Phase II of this project.
NTIS
Silicon Dioxide; Carbon Dioxide; Separation; Porous Materials; Nitrogen

20020076418 National Energy Technology Lab., Pittsburgh, PA USA
Oxygen transport ceramic membranes
Bandopadhyay, S.; Nagabhushana, N.; Apr. 01, 2002; 11p; In English
Report No.(s): DE2001-795773; FC26-99FT40054--08; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This report covers the following tasks: Task 1--Design, fabricate and evaluate ceramic to metal seals based on graded ceramic powder/metal braze joints; Task 2--Evaluate the effect of defect configuration on ceramic membrane conductivity and long term chemical and structural stability; Task 3--Determine materials mechanical properties under conditions of high temperatures and reactive atmospheres; Task 4--Evaluate phase stability and thermal expansion of candidate perovskite membranes and develop techniques to support these materials on porous metal structures; Task 5--Assess the microstructure of membrane materials to evaluate the effects of vacancy-impurity association, defect clusters, and vacancy-dopant association on the membrane performance and stability; and Task 6--Measure kinetics of oxygen uptake and transport in ceramic membrane materials under commercially relevant conditions using isotope labeling techniques.
NTIS
Ceramics; Mechanical Properties

20020076421 National Energy Technology Lab., Pittsburgh, PA USA

Ceramic membrane enabling technology for improved igcc efficiency

Prasad, R.; Apr. 01, 2000; 5p; In English

Report No.(s): DE2001-795779; FC26-99FT40437--01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this program is to conduct a technology development program to advance the state-of-the-art in ceramic Oxygen Transport Membranes (OTM) to the level required to produce step change improvements in process economics, efficiency, and environmental benefits for commercial IGCC (Integrated Gassification Combined Cycle) systems and other applications. The IGCC program is focused on addressing key issues in materials, processing, manufacturing, engineering and system development that will make the OTM a commercial reality. The objective of the OTM materials development task is to identify a suitable material that can be formed into a thin film to produce the target oxygen flux. This requires that the material have an adequate permeation rate, and thermo-mechanical and thermo-chemical properties such that the material is able to be supported on the desired substrate and sufficient mechanical strength to survive the stresses involved in operation. The objective of the composite OTM development task is to develop the architecture and fabrication techniques necessary to construct stable, high performance, thin film OTMs supported on suitable porous, load bearing substrates. The objective of the process development task of this program to demonstrate the program objectives on a single OTM tube under test conditions simulating those of the optimum process cycle for the power plant.

NTIS

Membrane Structures; Coal Gasification; Combined Cycle Power Generation; Ceramics; Porous Materials

20020076461 National Energy Technology Lab., Pittsburgh, PA USA

CO2 Selective Ceramic Membrane for Water-Gas Shift Reaction with Concomitant for the Recovery of CO2

May 08, 2002; 10p; In English

Report No.(s): DE2001-795766; FC26-00NT40922--09; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The reversibility study using TGA/MS has been completed. Our result shows that the hydrotalcite material we proposed exhibits a high degree of CO(sub 2) reversibility. In addition, at higher temperatures (>200 C), insignificant adsorption of water was observed. Combining these results, we conclude that the hydrotalcite we choose is an ideal candidate material for high temperature gas separations requiring hydrothermal stability. We also have focused on the optimization of membrane synthesis. The gel formed after combining the reagents is an ideal precursor for deposition within the porous membrane based upon the Al/Mg ratio analysis and impurity leaching study. Finally, we experimentally verify the crystal growth temperature ranging from 100 to 150 C. The crystal growth is also highly dependent upon the time. Our study shows a general growth pattern from 0 to >4 hours. In the next quarter, we will utilize the information obtained here to initiate the optimization of membrane synthesis.

NTIS

Ceramics; Carbon Dioxide; Chemical Reactions; Separation

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PROPELLANTS AND FUELS

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

20020075551 Johns Hopkins Univ., Chemical Propulsion Information Agency, Columbia, MD USA

38th JANNAF Combustion Subcommittee Meeting, Volume 1, *Nov. 2000 - Apr. 2002*

Fry, Ronald S., Editor, Johns Hopkins Univ., USA; Eggleston, Debra S., Editor, Johns Hopkins Univ., USA; Gannaway, Mary T., Editor, Johns Hopkins Univ., USA; April 2002; 659p; In English; 38th JANNAF Combustion Subcommittee Meeting, 8-12 Apr. 2002, Destin, FL, Destin, FL, Destin, FL, Destin, FL, USA, USA, USA, USA; Sponsored by Department of the Air Force, USA; Also announced as 20020075552 through 20020075599

Contract(s)/Grant(s): SPO700-97-D-4004

Report No.(s): CPIA-Publ-712-Vol-1; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

This volume, the first of two volumes, is a collection of 55 unclassified/unlimited-distribution papers which were presented at the Joint Army-Navy-NASA-Air Force (JANNAF) 38th Combustion Subcommittee (CS), 26 th Airbreathing Propulsion Subcommittee (APS), 20th Propulsion Systems Hazards Subcommittee (PSHS), and 21 Modeling and Simulation Subcommittee. The meeting was held 8-12 April 2002 at the Bayside Inn at The Sandestin Golf & Beach Resort and Eglin Air Force Base, Destin, Florida. Topics cover five major technology areas including: 1) Combustion - Propellant Combustion, Ingredient Kinetics, Metal Combustion, Decomposition Processes and Material Characterization, Rocket Motor Combustion, and Liquid & Hybrid Combustion; 2) Liquid Rocket Engines - Low Cost Hydrocarbon Liquid Rocket Engines, Liquid Propulsion Turbines, Liquid Propulsion Pumps, and Staged Combustion Injector Technology; 3) Modeling & Simulation - Development of Multi- Disciplinary RBCC Modeling, Gun Modeling, and Computational Modeling for Liquid Propellant Combustion; 4) Guns Gun Propelling Charge Design, and ETC Gun Propulsion; and 5) Airbreathing - Scramjet an Ramjet- S&T Program Overviews.
Author

Conferences; Propellant Combustion; Liquid Propellant Rocket Engines; Hybrid Propellant Rocket Engines; Models; Simulation; Propulsion System Performance

20020075552 Sandia National Labs., Combustion Research Facility, Livermore, CA USA

Summary of the Mini-Workshop on "Chemical Kinetics Issues Related to the Combustion of Thermally Damaged Energetic Materials

Behrens, Richard, Sandia National Labs., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 1-9; In English; Also announced as 20020075551

Contract(s)/Grant(s): DE-AC04-94AL-85000; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

This report summarizes a workshop held at the JANNAF Combustion Sciences Meeting, in November 2000, to discuss issues related to the chemical kinetics of the combustion of thermally damaged energetic materials. Recent findings in the propellants and explosives communities have shown that when these materials are thermally damaged their combustion characteristics are significantly altered and in some cases the burn rates are increased to near detonation velocities. The main objective of the workshop was to bring together experts from both the propellant and explosive communities, to discuss the relevant issues and to plan for future discussions and collaborations. Approximately twenty-five people participated in the workshop. In the twelve months following this workshop, two additional workshops have been held to address issues raised during the workshop. One workshop was sponsored by the C-SAFE program at the University of Utah and focused on the kinetics of RDX and HMX. The other workshop was sponsored by Los Alamos National Laboratory (LANL) and focused on the response of explosives in extreme thermal environments. A summary of the objectives and the general findings from these workshops is presented.
Author

Combustion Chemistry; Thermal Environments; HMX; Reaction Kinetics

20020075553 Naval Air Warfare Center, Research Dept., China Lake, CA USA

The Isothermal Decomposition and Sublimation of Large, TCP-Coated Ammonium Perchlorate Particles in the Cubic Phase

Kraeutle, K. J., Naval Air Warfare Center, USA; Atwood, A. I., Naval Air Warfare Center, USA; Curran, P. O., Naval Air Warfare Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 11-21; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The isothermal decomposition and sublimation of large TCP-coated ammonium perchlorate (AP) particles were studied in the temperature range 246-276 C where AP is in the cubic phase. The course of reaction was followed by measuring the weight loss as a function of temperature and time. Upon phase transition, AP became more stable. The analysis of the weight loss curves yielded activation energies E of 20.31 kcal/mole and 34.94 kcal/mole and preexponential factors A of 5.48 x 10(exp 6)/min and 1.20 x 10(exp 13)/min for the decomposition and initiation time, respectively, of cubic AP. Sublimation, in contrast to decomposition, did not show a break upon transition to the cubic phase. Weight loss data were analyzed by the same equation that was used for orthorhombic AP. The analysis yielded E = 31.25 kcal/mole and A = 5.95 x 10(exp 10)/hr for the kinetic parameters. Sublimation rates were considerably smaller than decomposition rates allowing analysis of decomposition data without correction for weight loss due to sublimation. Decomposition and sublimation kinetics for cubic AP were used to calculate the decomposition and sublimation rates of cubic AP that was heated at constant rates. The results were compared with Differential Scanning Calorimetry (DSC) tests and applied to determine the time to cookoff of AP oxidized propellants. Calculations with the proper decomposition kinetics as well as DSC test were found to be convenient means of predicting time to cookoff.
Author

Decomposition; Isothermal Processes; Ammonium Perchlorates; Phase Transformations

20020075555 Brigham Young Univ., Provo, UT USA

Condensed-Phase Model for HMX Decomposition

Washburn, E. B., Brigham Young Univ., USA; Beckstead, M. W., Brigham Young Univ., USA; Gross, M. L., Brigham Young Univ., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 33-42; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Many propellant ingredients melt during combustion, forming a thin liquid layer on the burning surface. Experimental measurements of the reaction kinetics and physical properties of this layer are difficult because the layer is thin, and the species are inherently transient in that layer. The Davidson model used to simulate combustion of propellant ingredients was expanded to replicate better the behavior of the HMX liquid/bubble phase. It is desirable to have the model calculations match the experimental data for burning rate temperature sensitivity, sigma(sub p), at low pressures. It is postulated that this can be accomplished in the model by more accurately modeling the effect of the exothermic reactions in the bubbles. The model was changed to include the energy equation separately for each phase. The momentum equations for each phase are shown, but they are not yet solved. The calculated sigma(sub p) values increased as the velocity of the bubbles approached that of the liquid and as the pre-exponential factor for the 'bubble reaction' was increased. This demonstrates that the calculated gas decomposition products must be slowed down for their subsequent reactions to have an effect. Also, additional gas-phase reactions need to be considered now that they influence the computed sigma(sub p) values.

Author

Decomposition; Propellants; Ingredients; Exothermic Reactions; HMX; Reaction Kinetics; Vapor Phases

20020075559 Illinois Univ. at Urbana-Champaign, Center for the Simulation of Advanced Rockets, Urbana, IL USA

Homogenization Issues in the Combustion of Heterogeneous Solid Propellants

Chen, M., Illinois Univ. at Urbana-Champaign, USA; Buckmaster, J., Illinois Univ. at Urbana-Champaign, USA; Jackson, T. L., Illinois Univ. at Urbana-Champaign, USA; Massa, L., Illinois Univ. at Urbana-Champaign, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 91-97; In English; Also announced as 20020075551

Contract(s)/Grant(s): B341494; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

We examine random packs of discs or spheres, models for ammonium-perchlorate-in-binder propellants, and discuss their average properties. An analytical strategy is described for calculating the mean or effective heat conduction coefficient in terms of the heat conduction coefficients of the individual components, and the results are verified by comparison with those of direct numerical simulations (dns) for both 2-D (disc) and 3-D (sphere) packs across which a temperature difference is applied. Similarly, when the surface regression speed of each component is related to the surface temperature via a simple Arrhenius law, an analytical strategy is developed for calculating an effective Arrhenius law for the combination, and these results are verified using dns in which a uniform heat flux is applied to the pack surface, causing it to regress. These results are needed for homogenization strategies necessary for fully integrated 2-D or 3-D simulations of heterogeneous propellant combustion.

Author

Homogenizing; Heterogeneity; Solid Propellant Combustion; Binders (Materials)

20020075565 Alliant Ammunition and Powder Co., LLC, Radford, VA USA

Material Issues of Double-Base Propellants

Yu, J., Alliant Ammunition and Powder Co., LLC, USA; Shaw, W., Alliant Ammunition and Powder Co., LLC, USA; Williams, T., Alliant Ammunition and Powder Co., LLC, USA; Ritchie, S., Alliant Ammunition and Powder Co., LLC, USA; Worrell, W. J., Alliant Ammunition and Powder Co., LLC, USA; Gagne, M., Atlantic Research Corp., USA; Green, D., Atlantic Research Corp., USA; Daigle, L. A., Polymer Solutions, Inc., USA; Rancourt, J., Polymer Solutions, Inc., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 157-169; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Previously unexplored mechanical properties of extruded, double-base propellant grains have been found to be of importance to the successful operation of a rocket motor. Insufficient mechanical properties may lead to excessive deflections of and damage to head end restrained grains, especially under high temperature fast combustion conditions. The organic components of double-base propellants, particularly nitrocellulose (NC), and their time-and-temperature dependent physical aging behavior can change the material properties of the propellant, gradually stiffening and stabilizing the grain. Material characterization of a double-base propellant modulus, coefficient of thermal expansion (CTE) and other physical properties after all production processing, such as real-time aging or annealing is crucial to the design of successful rocket motors. This study investigated a specific double-base propellant to be used as a launch motor for tactical missiles. Different analytical methods such as DMA, TMA, and unique tension tests were performed on the propellant to measure the effect of different processing conditions. Results showed that the different lots of extruded propellants exhibit similar characteristics. However, variations of NC and process

conditions create fluctuation in the material physical properties (in particular the material modulus) and their response to loading rate and temperature. This was especially apparent at low and high frequencies shown by the master curves generated through the principle of time-temperature superposition. Master curves of recent production material were compared with grains produced three years earlier, and showed a significant increase in modulus at low frequencies (or high temperatures) in the older grains. The annealing process was also found to be crucial in removing dimensional instabilities of the propellant. We conclude that real-time aging or annealing enhances the mechanical properties of the propellant in regard to modulus up to a limit. The improvement limit due to annealing may be different for each grain depending on the composition of raw materials, processing, and NC variability.
Author
Propellants; Extruding; Propellant Grains; Cellulose Nitrate; Double Base Propellants; Thermal Expansion

20020075574 Software and Engineering Associates, Inc., Carson City, NV USA
New Capabilities in Solid Rocket Motor Grain Design Modeling (SPP 2002)
French, J. C., Software and Engineering Associates, Inc., USA; Dunn, S. S., Software and Engineering Associates, Inc., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 317-331; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The Solid Performance Program (SPP) is the JANNAF sponsored design tool for solid rocket motor development. Software and Engineering Associates, Inc. (SEA) has maintained this code, and is currently releasing version SPP'02. This version contains several improvements that are useful for grain design and ballistics analysis, visualization and ease of use. A new segmented motor option allows for a bum rate and multiplier for different axial sections of the grain. A similar dual propellant option allows the user to specify different bum rates for different propellant formulations along the grain, which allows the user to design a motor with different propellant characteristics for boost and sustain. An insulation option allows the user to place insulation on the motor case and alerts the user in the analysis when the insulation is first exposed at an axial location. Three new grain design macros have been included to simplify the input of a burning axial wire embedded in the grain, to carve out an axial slot, and for packing multiple hollow rods of grain (straws) in an empty case. A new perimeter computation yields the total, burning and insulation exposure of the grain surface at consecutive axial stations and web steps. An additional computation connects adjacent perimeters to form a finite element surface mesh, which when displayed for sequential time steps animates the bum-back of the motor grain. This paper details the approaches used to implement these features, and as most of these features were added and validated in the design of classified motors, generic examples are used to demonstrate their utility.
Author
Computer Programming; Computational Grids; Design Analysis; Propellant Grains; Rocket Engine Design

20020075579 Sandia National Labs., Combustion Research Facility, Livermore, CA USA
Development of a Physicochemical Model for the Thermal Decomposition of RDX
Maharrey, Sean, Sandia National Labs., USA; Wiese-Smith, Deneille, Sandia National Labs., USA; Behrens, Richard, Sandia National Labs., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 373-386; In English; Also announced as 20020075551
Contract(s)/Grant(s): DE-AC04-94AL-85000; ARO-39302-CH; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Simultaneous thermogravimetric modulated beam mass spectrometry (STMBMS), optical microscopy, and scanning electron microscopy (SEM) have been used to study the physical and chemical processes that control the thermal decomposition of RDX. Results indicate that there is a complex set of parallel processes that control the decomposition. The extent of confinement of the gaseous decomposition products with the remaining RDX varies the relative importance of these parallel pathways. The decomposition of RDX has been studied over the temperature range from 160 to 215 C. A nucleation process involving the growth of a non-volatile residue (NVR) among the RDX particles controls the rate of the solid-phase decomposition reaction, and although the late stage NVR process is now also observed in the liquid-phase decomposition, its mechanism of development during the course of the decomposition reaction is currently unknown. Once the NVR has formed, the interactions between RDX/mononitroso-RDX/gas-phase decomposition products with the NVR become the dominant reaction pathway in the solid-phase and an important parallel pathway in the liquid-phase decomposition. During this interaction, the main gas products evolved are H2O, COM2, CH2O, NO, and N2O. Decomposition of the NVR is also observed and results in the evolution of more complex gas products than are observed in the RDX decomposition. These NVR decomposition products include: N-methylformamide, N,Ndimethylformamide, dimethylnitrosamine and C3H9N (a form of amine). We observe acceleration in the initial rate oust after melting) of a liquid-phase decomposition with addition of NVR from a previous solid or liquid-phase experiment, indicating that liquefaction of RDX by the NVR is not uniquely responsible for the observed autocatalytic effect.

These RDX/NVR decomposition processes are coupled with previously developed processes covering the liquid-phase thermal decomposition of RDX under lower gas confinement, where the NVR process does not fully develop. Mathematical models characterizing these processes are under development. The parameters for these decomposition models are being determined from the STMBMS, optical micrograph, and SEM data.
Author
Thermal Decomposition; RDX; Chemical Reactions; Mathematical Models; Melting; Thermogravimetry

20020075581 Sandia National Labs., Combustion Research Facility, Livermore, CA USA
Thermal Decomposition of HMX: Morphological and Chemical Changes Induced at Slow Decomposition Rates
Behrens, Richard, Sandia National Labs., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 397-408; In English; Also announced as 20020075551
Contract(s)/Grant(s): DE-AC04-94AL-85000; ARO-38302-CH; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

An overview of the chemical and physical processes that occur during the thermal decomposition of HMX at temperatures below its melting point (approx. 270 C) is presented. Reactions in the gas, solid and molten phases all contribute to the overall decomposition process. As HMX is heated and it begins to decompose, morphological changes occur in the solid particles. The Beta- greater than delta phase transition creates a grain structure within the particles and causes cracking. In addition, nucleation and growth of reaction regions within the grains leads to the formation of bubbles filled with gaseous decomposition products and a nonvolatile residue (NVR). The types of chemical reactions that control the decomposition include unimolecular decomposition reactions, bimolecular reactions with the gaseous decomposition products and reactions with the NVR. Reactions with the NVR occur at interfacial boundaries associated with the bubbles and grain boundaries. Thus, the changing morphological features of the sample play an important role in its rate of decomposition. A qualitative model of these overall processes and the development of a new reaction modeling kinetics compiler and analysis tool are presented.
Author
Thermal Decomposition; HMX; Chemical Reactions; Morphology; Phase Transformations

20020075582 Sandia National Labs., Albuquerque, NM USA
Real-Time Ultrasonic Characterization of Thermally-Damaged Energetic Materials Approaching Cookoff
Tappan, A. S., Sandia National Labs., USA; Renlund, A. M., Sandia National Labs., USA; Miller, J. C., Sandia National Labs., USA; Casstevens, J. E., Sandia National Labs., USA; Oliver, M. S., Sandia National Labs., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 409-415; In English; Also announced as 20020075551
Contract(s)/Grant(s): DE-AC04-94AL-85000; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Understanding the physical properties of thermally-damaged energetic materials in cookoff scenarios is vital to developing and validating predictive codes to describe ignition and post-ignition behavior. We report work in progress on a small-scale experiment, called the ”ultrasonic hot cell” to determine how certain physical properties of energetic materials change as thermal damage evolves. The experiment involves the controlled heating of a 6.35-mm-diameter cylindrical energetic material sample within rigid radial confinement. Moveable pistons provide the axial confinement on the sample, which is measured by a load cell and LVDT extensometer and feedback-controlled by means of a pneumatic cylinder. Ultrasonic time-of-flight measurements are taken and combined with LVDT length measurements to measure the ultrasonic velocity as the material decomposes. by combining data from shear and longitudinal ultrasonic experiments, the real-time elastic moduli of thermally-degraded HMX (1,3,5,7-tetranitro-1,3,5,7-tetraazacyclooctane) and PBX-9501 (95% HMX, 2.5% Estane, 2.5% BDNPA-F (bis(2,2-dinitropropyl) acetal/formal)), at several, constant axial force loads are measured. The effect of heating on Composition B (60% RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine), 40% TNT (trinitrotoluene)) is also examined.
Author
Real Time Operation; Temperature Effects; Damage; Chemical Properties; Firing (Igniting); HMX

20020075583 Los Alamos National Lab., NM USA
Measurement of Gas Permeability of Thermally Damaged PBX 9501
Assay, B. W., Los Alamos National Lab., USA; Schaefer, T., Los Alamos National Lab., USA; Dickson, P., Los Alamos National Lab., USA; Henson, B., Los Alamos National Lab., USA; Smilowitz, L., Los Alamos National Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 417-423; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

We have constructed a gas permeameter to measure the permeability of explosives that have been thermally damaged. We report on the calibration of the instrument as well as initial measurements of the permeability of pristine and damaged PBX 9501. We are beginning a program that will provide detailed static and dynamic permeability measurements on a range of explosives under different conditions. These data are essential if adequate predictions of ignition and violence in cookoff are to be obtained. Author

Measuring Instruments; Permeability; Gases; Thermal Decomposition; Damage

20020075585 General Applied Science Labs., Inc., Ronkonkoma, NY USA

Summary of Test Medium Working Group Workshop I

Chinitz, Wallace, General Applied Science Labs., Inc., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 435-440; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The high total enthalpies (temperatures) required when ground testing airbreathing, high flight Mach number, aeropropulsion engines necessitates contaminating the facility ”air” (i.e., the test medium) to some extent. The presence of these contaminants can have a profound effect on the test results and on the interpretation of those results. The JANNAF Interagency Propulsion Committee’s Airbreathing Propulsion Subcommittee, through its Test and Evaluation Panel, has elected to convene a ”Test Medium Working Group” open to all members of the U.S. hypersonics; community. The Working Group is charged (at a minimum) with arriving at recommendations to that community for dealing with these issues. A Workshop was convened at the 50th JANNAF Propulsion Meeting in July 2001. The conclusions reached at that Workshop, as well as actions taken based on those conclusions, are discussed herein.

Author

Air Breathing Engines; Enthalpy; Ground Tests; High Temperature

20020075596 Los Alamos National Lab., NM USA

Combustion Performance of Metastable Intermolecular Composites (MIC)

Bockmon, B., Texas Technological Univ., USA; Son, S. F., Los Alamos National Lab., USA; Asay, B. W., Los Alamos National Lab., USA; Busse, J. R., Los Alamos National Lab., USA; Mang, J. T., Los Alamos National Lab., USA; Peterson, P. D., Los Alamos National Lab., USA; Pantoya, M., Texas Technological Univ., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 613-624; In English; Also announced as 20020075551

Contract(s)/Grant(s): W-7405-eng-36; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Application of thermite materials has been limited because of the relative slow release of energy compared to other energetic materials. Thermite materials are attractive energetic materials because the reactions are highly exothermic, have high energy densities, and high temperatures of combustion. Engineered nano-scale composite energetic materials, such as Al/MoO3, show promise for additional energetic material applications because they can react very rapidly. The composite material studied in this work consists of tailored, ultra-fine grain (30-200 nm diameter) aluminum particles that dramatically increase energy release rates of these thermite materials. These reactant clusters of fuel and oxidizer particles are in nearly atomic scale proximity to each other but are constrained from reaction until triggered. Despite the growing importance of nano-scale energetic materials, even the most basic combustion characteristics of these materials have not been thoroughly studied. This paper reports initial studies of the ignition and combustion of metastable intermolecular composites (MIC) materials. The goals were to obtain an improved understanding of flame propagation mechanisms and combustion behaviors associated with nano-structured energetic materials. Information on issues such as reaction rate and behavior as a function of composition (mixture ratio), initial static charge, and particle size are essential and will allow scientists to design applications incorporating the benefits of these compounds. The materials have been characterized, specifically focusing on particle size, shape, distribution and morphology.

Author

Combustion; Thermites; Aluminum; Molybdenum Oxides; Ignition; Reaction Kinetics; Metastable State

20020075599 Naval Air Warfare Center, Research Dept., China Lake, CA USA

Oxidizer Coated Aluminum for Reduced Agglomeration in Propellants

Parr, Tim, Naval Air Warfare Center, USA; Johnson, Curtis, Naval Air Warfare Center, USA; Hanson-Parr, Donna, Naval Air Warfare Center, USA; Higa, Kelvin, Naval Air Warfare Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 649-656; In English; Also announced as 20020075551

Contract(s)/Grant(s): N00014-01-WX-20620; N00014-02-WX-20613; N00014-01-WX-20621; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Nanoscale metal fuels and metal oxidizer composite particles are under investigation in order to control the combustion environment at the nano scale. Normal metal combustion in solid propellants is hampered by agglomeration. The metal (typically aluminum) melts at the burning surface of the propellant and small particles agglomerate into very large droplets that accumulate on the propellant surface for quite a long time. The large size limits the combustion rate, as the diffusive burning rate of droplets is inversely proportional to the droplet diameter to a power of approximately two. The energy of the aluminum combustion is released far away from the propellant surface and does not drive the propellant regression process. Preliminary experiments with specially fabricated oxidizer coated aluminum have clearly shown that the ignition of the loaded aluminum can be speed up to significantly reduce agglomeration and thereby greatly increase combustion rates. This is related to the process of creating combustion environments, complete with fuel and oxidizer, on the nano scale. With the immediate proximity of oxidizer for the metal, combustion can start unimpeded by diffusive length scales. The oxidizer coatings lowered the ignition temperature, enhanced combustion rates, and allowed greater heat release close to the propellant surface (where it can drive decomposition and regression rates). Specifically, a thin (about 300 nm) coating of barium sulfate on five-micron aluminum particles caused a reduction in ignition temperature from 1730 K for uncoated aluminum to less than 1000 K for the coated material. The particle burn rate was four times higher at 2130 K for the coated aluminum, and forty times higher at 1730 K. In a propellant formulation the coated aluminum exhibited about a 3 to 4-fold reduction in burning agglomerate size.
Author
Coatings; Aluminum; Oxidizers; Agglomeration; Burning Rate; Solid Propellants; Combustion Chemistry

20020075671 Argonne National Lab., IL USA
Reforming petroleum-based fuels for fuel cell vehicles : composition-performance relationships.
Kopasz, J. P.; Miller, L. E.; Ahmed, S.; Devlin, P. R.; Pacheco, M.; Dec. 04, 2001; 7p; In English
Report No.(s): DE2001-795819; ANL/CMT/CP-105592; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Onboard reforming of petroleum-based fuels, such as gasoline, may help ease the introduction of fuel cell vehicles to the marketplace. Although gasoline can be reformed, it is optimized to meet the demands of ICEs. This optimization includes blending to increase the octane number and addition of oxygenates and detergents to control emissions. The requirements for a fuel for onboard reforming to hydrogen are quite different than those for combustion. Factors such as octane number and flame speed are not important; however, factors such as hydrogen density, catalyst-fuel interactions, and possible catalyst poisoning become paramount. In order to identify what factors are important in a hydrocarbon fuel for reforming to hydrogen and what factors are detrimental, we have begun a program to test various components of gasoline and blends of components under autothermal reforming conditions. The results indicate that fuel composition can have a large effect on reforming behavior. Components which may be beneficial for ICEs for their octane enhancing value were detrimental to reforming. Fuels with high aromatic and naphthenic content were more difficult to reform. Aromatics were also found to have an impact on the kinetics for reforming of paraffins. The effects of sulfur impurities were dependent on the catalyst. Sulfur was detrimental for Ni, Co, and Ru catalysts. Sulfur was beneficial for reforming with Pt catalysts, however, the effect was dependent on the sulfur concentration.
NTIS
Combustion; Fuel Cells; Gasoline; Catalytic Activity; Hydrocarbon Fuels; Hydrogen Fuels

20020075672 Argonne National Lab., IL USA
Preliminary assessment of the availability of U.S. natural gas resources to meet U.S. transportation energy demand.
Singh, M. K.; Moore, J. S.; Mar. 04, 2002; 12p; In English
Report No.(s): DE2001-795818; ANL/ES/CP-107020; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Recent studies have indicated that substitutes for conventional petroleum resources will be needed to meet U.S. transportation energy demand in the first half of this century. One possible substitute is natural gas which can be used as a transportation fuel directly in compressed natural gas or liquefied natural gas vehicles or as resource fuel for the production of hydrogen for fuel cell vehicles. This paper contains a preliminary assessment of the availability of U.S. natural gas resources to meet future U.S. transportation fuel demand. Several scenarios of natural gas demand, including transportation demand, in the U.S. to 2050 are developed. Natural gas resource estimates for the U. S. are discussed. Potential Canadian and Mexican exports to the U.S. are estimated. Two scenarios of potential imports from outside North America are also developed. Considering all these potential imports, U.S. natural gas production requirements to 2050 to meet the demand scenarios are developed and compared with the estimates of U.S. natural gas resources. The comparison results in a conclusion that (1) given the assumptions made, there are

likely to be supply constraints on the availability of U.S. natural gas supply post-2020 and (2) if natural gas use in transportation grows substantially, it will have to compete with other sectors of the economy for that supply-constrained natural gas.
NTIS
Compressed Gas; Earth Resources; Liquefied Natural Gas; International Trade

20020075968 Argonne National Lab., IL USA
What futurecar MPG levels and technology will be necessary
Patterson, P.; Steiner, E.; Singh, M.; Mar. 04, 2002; 15p; In English
Report No.(s): DE2001-795814; ANL/ES/CP-107019; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The potential peaking of world conventional oil production and the possible imperative to reduce carbon emissions will put great pressure on vehicle manufacturers to produce more efficient vehicles, on vehicle buyers to seek them out in the marketplace, and on energy suppliers to develop new fuels and delivery systems. Four cases for stabilizing or reducing light vehicle fuel use, oil use, and/or carbon emissions over the next 50 years are presented. Case 1--Improve mpg so that the fuel use in 2020 is stabilized for the next 30 years. Case 2--Improve mpg so that by 2030 the fuel use is reduced to the 2000 level and is reduced further in subsequent years. Case 3--Case 1 plus 50% ethanol use and 50% low-carbon fuel cell vehicles by 2050. Case 4--Case 2 plus 50% ethanol use and 50% low-carbon fuel cell vehicles by 2050. The mpg targets for new cars and light trucks require that significant advances be made in developing cost-effective and very efficient vehicle technologies. With the use of alternative fuels that are low in carbon, oil use and carbon emissions can be reduced even further.
NTIS
Cost Effectiveness; Fuel Oils; Energy Policy

20020075973 Argonne National Lab., IL USA
Measurement of gasoline spray propagation by means of synchrotron x- ray.
Yue, Y.; Powell, C.; Cuenca, R.; Poola, R.; Wang, J.; May 24, 2002; 4p; In English
Report No.(s): DE2001-795808; ANL/ES/CP-107314; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A quantitative and time-resolved radiographic technique has been used to characterize hollow-cone gasoline sprays in the near-nozzle region. The highly penetrative nature of x-rays promises the direct measurements of dense sprays that are difficult to study by visible-light based techniques. Time-resolved x-radiography measurement enables us to map the mass distribution near the spray nozzle, even immediately adjacent to the orifice. The quantitative nature of the measurement also permits the re-construction of spray structure and the progress of the spray development. It is observed that the speed of fuel injected in the later part of the injection is higher than injected earlier and that the initial fuel speed variation caused the spray plume to be compressed in space.
NTIS
Gasoline; X Rays; Fuel Injection; Spray Nozzles; Atomizing

20020076038 Argonne National Lab., IL USA
Integrated fuel processor development.
Ahmed, S.; Pereira, C.; Lee, S. H. D.; Krumpelt, M.; Dec. 04, 2001; 6p; In English
Report No.(s): DE2001-795822; ANL/CMT/CP-106354; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Department of Energy's Office of Advanced Automotive Technologies has been supporting the development of fuel-flexible fuel processors at Argonne National Laboratory. These fuel processors will enable fuel cell vehicles to operate on fuels available through the existing infrastructure. The constraints of on-board space and weight require that these fuel processors be designed to be compact and lightweight, while meeting the performance targets for efficiency and gas quality needed for the fuel cell. This paper discusses the performance of a prototype fuel processor that has been designed and fabricated to operate with liquid fuels, such as gasoline, ethanol, methanol, etc. Rated for a capacity of 10 kWe (one-fifth of that needed for a car), the prototype fuel processor integrates the unit operations (vaporization, heat exchange, etc.) and processes (reforming, water-gas shift, preferential oxidation reactions, etc.) necessary to produce the hydrogen-rich gas (reformate) that will fuel the polymer electrolyte fuel cell stacks. The fuel processor work is being complemented by analytical and fundamental research. With the ultimate objective of meeting on-board fuel processor goals, these studies include: modeling fuel cell systems to identify design

and operating features; evaluating alternative fuel processing options; and developing appropriate catalysts and materials. Issues and outstanding challenges that need to be overcome in order to develop practical, on-board devices are discussed.
NTIS
Catalysts; Evaporation; Fuel Cells; Liquid Fuels; Heat of Vaporization

20020076103 Union Carbide Corp., Y-12 Plant, Oak Ridge, TN USA
Hydriding Kinetics of Organic Hydrogen Getters
Powell, G. L.; Feb. 11, 2002; 1p; In English
Report No.(s): DE2001-797452; Y/DZ-2279 R1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The aging of hermetically sealed systems is often accompanied by the gradual production of hydrogen gas that is a result of the decay of environmental gases and the degradation of organic materials. In particular, the oxygen, water, hydrogen 'equilibrium' is affected by the removal of oxygen due the oxidation of metals and organic materials. This shift of the above 'equilibrium' towards the formation of hydrogen gas, particularly in crevices, may eventually reach an explosive level of hydrogen gas or degrade metals by hydriding them. The latter process is generally delayed until the oxidizing species are significantly reduced. Organic hydrogen getters introduced by Allied Signal Aerospace Company, Kansas City Division have proven to be a very effective means of preventing hydrogen gas accumulation in sealed containers. These getters are relatively unaffected by air and environmental gases. They can be packaged in a variety of ways to fit particular needs such as porous pellets, fine or coarse (gravel) powder, or loaded into silicone rubber. The hydrogen gettering reactions are extremely irreversible since the hydrogen gas is converted into an organic hydrocarbon. These getters are based on the palladium-catalyzed hydrogenation of triple bonds to double and then single bonds in aromatic aryl compounds. DEB (1,4 bis (phenyl ethynyl) benzene) typically mixed with 25% by weight carbon with palladium (1% by weight of carbon) is one of the newest and best of these organic hydrogen getters. The reaction mechanisms are complex involving solid state reaction with a heterogeneous catalyst leading to the many intermediates, including mixed alkyl and aryl hydrocarbons with the possibilities of many isomers. The reaction kinetics mechanisms are also strongly influenced by the form in which they are packaged. For example, the hydriding rates for pellets and gravel have a strong dependence on reaction extent (i.e., DEB reduction) and a kinetic order in pressure of 0.76. Silicone rubber based DEB getters hydride at a much lower rate, have little dependence on reaction extent, have a higher kinetic order in pressure (0.87), and have a lower activation energy. The kinetics of the reaction as a function of hydrogen pressure, stoichiometry, and temperature for hydrogen and deuterium near ambient temperature (0 to 75 C) for pressures near or below 100 Pa over a wide range (in some cases, the complete) hydrogenation range are presented along with multi-dimensional rate models.
NTIS
Reaction Kinetics; Hydrogenation; Stoichiometry; Organic Materials; Getters

20020076338 Swedish Defence Research Establishment, Weapons and Protection Div., Tumba Sweden
Liquid and Gelled Propellants for Rocket and Ramjet Engines ***Flytande och Gelade Drivaemnen foer Raket-och Rammotorer***
Sanden, R.; Mar. 2000; 24p; In Swedish
Report No.(s): PB2002-106834; FOA-R-00-01469-310-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This literature study has been undertaken by order of FMV. The monopropellants considered to be the most suited for tactical purposes are hydrazine and its derivatives despite their poisonous properties. Moderately high performance is obtained, yet with bipropellants both high performance and non-smoke properties can be achieved. The bipropellant combination creating most interest in the USA at present is nitric acid of the IRFNA type and monomethylhydrazine. by gelling the propellants the risk at handling can be decreased considerably. Stable suspensions can be prepared with fillers, which will further increase performance. The development of ramjet fuels has over the last few years been on hydrocarbons with higher density to increase the volumetric impulse. Compact multiring-shaped molecules, which give higher performance than the standard ramjet fuel JP-10, are currently under study in the USA.
NTIS
Rocket Propellants; Gelled Rocket Propellants; Liquid Rocket Propellants; Hydrocarbons

20020076420 National Energy Technology Lab., Pittsburgh, PA USA
Low cost and high quality solid fuel from biomass and coal fines
Kelly, J. T.; Miller, G.; Namazian, M.; Jul. 01, 2001; 134p; In English
Report No.(s): DE2001-795777; AC26-99FT40157--01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Use of biomass wastes as fuels in existing boilers would reduce greenhouse gas emissions, SO2 and NOx emissions, while beneficially utilizing wastes. However, the use of biomass has been limited by its low energy content and density, high moisture content, inconsistent configuration and decay characteristics. If biomass is upgraded by conventional methods, the cost of the fuel becomes prohibitive. Altex has identified a process, called the Altex Fuel Pellet (AFP) process, that utilizes a mixture of biomass wastes, including municipal biosolids, and some coal fines, to produce a strong, high energy content, good burning and weather resistant fuel pellet, that is lower in cost than coal. This cost benefit is primarily derived from fees that are collected for accepting municipal biosolids. Besides low cost, the process is also flexible and can incorporate several biomass materials of interest The work reported on herein showed the technical and economic feasibility of the AFP process. Low-cost sawdust wood waste and light fractions of municipal wastes were selected as key biomass wastes to be combined with biosolids and coal fines to produce AFP pellets. The process combines steps of dewatering, pellet extrusion, drying and weatherizing. Prior to pilot-scale tests, bench-scale test equipment was used to produce limited quantities of pellets for characterization. These tests showed which pellet formulations had a high potential. Pilot-scale tests then showed that extremely robust pellets could be produced that have high energy content, good density and adequate weatherability. It was concluded that these pellets could be handled, stored and transported using equipment similar to that used for coal. Tests showed that AFP pellets have a high combustion rate when burned in a stoker type systems. While NOx emissions under stoker type firing conditions was high, a simple air staging approach reduced emissions to below that for coal. In pulverized-fuel-fired tests it was found that the ground pellets could be used as an effective NOx control agent for pulverized-coal-fired systems. NOx emissions reductions up to 63% were recorded, when using AFP as a NOx control agent. In addition to performance benefits, economic analyses showed the good economic benefits of AFP fuel. Using equipment manufacturer inputs, and reasonable values for biomass, biosolids and coal fines costs, it was determined that an AFP plant would have good profitability. For cases where biosolids contents were in the range of 50%, the after tax Internal Rates of Return were in the range of 40% to 50%. These are very attractive returns. Besides the baseline analysis for the various AFP formulations tested at pilot scale, sensitivity analysis showed the impact of important parameters on return. From results, it was clear that returns are excellent for a range of parameters that could be expected in practice. Importantly, these good returns are achieved even without incentives related to the emissions control benefits of biomass.
NTIS
Waste Energy Utilization; Pollution Control; Biomass; Wastes; Fuels

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.

20020073794 Johns Hopkins Univ., Chemical Propulsion Information Agency, Columbia, MD USA
2nd JANNAF Modeling and Simulation Subcommittee Meeting, Volume 1, *Nov. 2000 - Apr. 2000*
Fry, Ronald S., Editor, Johns Hopkins Univ., USA; Gannaway, Mary T., Editor, Johns Hopkins Univ., USA; 2nd JANNAF Modeling and Simulation Subcommittee Meeting; April 2002; 352p; In English; 2nd JANNAF Modeling and Simulation Subcommittee Meeting, 8-12 Apr. 2002, Destin, FL, Destin, FL, Destin, FL, Destin, FL, USA, USA, USA, USA; Also announced as 20020073795 through 20020073820
Contract(s)/Grant(s): SPO700-97-D-4004
Report No.(s): CPIA-Publ-715-Vol-1; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

This volume, the first of two volumes, is a collection of twenty-six unclassified/unlimited-distribution papers which were presented at the Joint Army-Navy-NASA-Air Force (JANNAF) Second Modeling and Simulation Subcommittee (MSS) held jointly with the thirty-eighth Combustion Subcommittee (CS), twenty-sixth Airbreathing Propulsion Subcommittee (APS), and twentieth Propulsion Systems Hazards Subcommittee (PSHS). The meeting was held 8-12 April 2002 at the Bayside Inn at The Sandestin Golf and Beach Resort and Eglin Air Force Base, Destin, Florida. Topics covered include: uncertainty assessment and management; virtual engineering; integrated vehicle health management (IVHM) intelligent systems; IVHM propulsion; and modeling and simulation of components, complex hydrocarbon fuels and unsteady processes and liquid propulsion combustion systems.
Author
Assessments; Simulation; Artificial Intelligence; Propulsion; Fuels; Systems Health Monitoring

20020074581 University of Western Kentucky, Dept. of Chemistry, Bowling Green, KY USA
Acquisition of an X-ray Diffractometer for Nanotechnology Research ***Final Report, 1 May 2001-30 Apr. 2002***
Pan, Wei-Ping; Riley, John T.; Apr. 2002; 8p; In English
Contract(s)/Grant(s): F49620-01-1-0334; Proj-3484
Report No.(s): AD-A404860; AFRL-SR-AR-TR-02-0248; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objective of this project was to acquire a X-ray diffraction spectrometer for the study of nanomaterials. In a current project supported by the Air Force Office of Sponsored Research, the WKU Materials Characterization Center (MCC) is conducting research on polymer/clay nanocomposites, with the intent of gaining a better understanding of the relationship between processing and the microstructure properties of the nanomaterials. The Center plans to use its current holdings and projects to establish a Nanomaterials Research Laboratory. Prior to this project, the available instrumentation included atomic force microscopy/Micro-TA, scanning electron microscopy, and transmission electron microscopy. However, these instruments can not provide all the necessary information for current and proposed projects, and there was a pressing need for an x-ray diffraction (XRD) system for microstructure analysis of nanocomposites.

DTIC
Diffractometers; Nanotechnology; Scanning Electron Microscopy; Transmission Electron Microscopy; Atomic Force Microscopy; Microstructure

20020074822 Air Force Research Lab., Edwards AFB, CA USA
AFRL Propulsion Directorate Briefing for Industry
Quinn, Lawrence P.; Jul. 1998; 45p; In English
Report No.(s): AD-A404862; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mission statement of the AFRL is to create rocket propulsion technologies for the warfighter to control and exploit space and air.

DTIC
Propulsion; Navy; Research; Rockets

20020074835 Air Force Research Lab., Edwards AFB, CA USA
Air Force Research Laboratory Propulsion Directorate Test Facilities
Aug. 1998; 95p; In English
Report No.(s): AD-A404864; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

These viewgraphs concern the Air Force Research Laboratory Propulsion Directorate Test Facilities.

DTIC
Test Facilities; Research; Propulsion; Rocket Thrust

20020075026 Army Research Lab., Human Research and Engineering Directorate, Aberdeen Proving Ground, MD USA
Modeling Workload for Target Detection from a Moving Vehicle With a Head-Mounted Display and Sound Localization ***Final Report***
Smyth, Christopher C.; Jun. 2002; 79p; In English; Original contains color images
Report No.(s): AD-A405050; ARL-TR-2759; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The effect of indirect vision systems on target detection and recognition is of interest to designers of future combat vehicles. In this report, a model of target detection and mental workload is described for an indirect vision system with a micro-state task time line analysis of attention workload. The model is based on the results of a field study in which participants detected and identified pop-up targets on an outdoor range from a stationary and a moving vehicle while using a head-mounted display (HMD), with and without sound localization and with direct viewing as a control. A head-slaved camera mounted on top of the vehicle provided the image to the HMD. As a result of the study, a target detection and identification model is derived for the different treatments from the data via regression analysis. The effect of indirect vision on mental workload is determined from the subjective ratings of perceived task loading that were reported in the field study. Along with the perceived workload, the study participants rated the mental measures of task-allocated attention, situational awareness, and motion sickness. Because of collinearity, the perceived workload is regressed on the factorial components of a cognitive loading space derived from a factorial analysis of the mental measures. Following rotation to a ”skills-rules-knowledge” cognitive processing space derived from the clustering of the measures, the perceived workload is shown to be a function of the skill- and rule-based components. On this basis, a micro-state time line model is proposed for the task information processing. In addition to the attention allocated to the targeting task, the

model includes attention to cognitive maps for target orienting by the audio cues and the monitoring of the internal somatic state for motion sickness.
DTIC
Target Recognition; Helmet Mounted Displays; Head-Up Displays; Sound Localization

20020076100 Cryopolymers, Inc., Saint Francisville, LA USA
Tire Recycling
Spinoff 1997; 1997, pp. 90-91; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Cryopolymers, Inc. tapped NASA expertise to improve a process for recycling vehicle tires by converting shredded rubber into products that can be used in asphalt road beds, new tires, hoses, and other products. In conjunction with the Southern Technology Applications Center and Stennis Space Center, NASA expertise in cryogenic fuel-handling needed for launch vehicle and spacecraft operations was called upon to improve the recycling concept. Stennis advised Cryopolymers on the type of equipment required, as well as steps to reduce the amount of liquid nitrogen used in the process. They also guided the company to use more efficient ways to control system hardware. It is estimated that more than 300 million tires nationwide are produced per year. Cryopolymers expects to reach a production rate of 5,000 tires recycled per day.
Author
Tires; Cryogenics; Rubber; Asphalt; Liquid Nitrogen; Recycling

20020076101 Displaymor Mfg. Co., Inc., Los Angeles, CA USA
Refrigeration Showcases
Spinoff 1997; 1997, pp. 83; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Through the Technology Affiliates Program at the Jet Propulsion Laboratory (JPL), valuable modifications were made to refrigerator displays built by Displaymor Manufacturing Company, Inc. by working with JPL, Displaymor could address stiffer requirements that ensure the freshness of foods. The application of the space technology meant that the small business would be able to continue to market its cases without incurring expenses that could threaten the viability of the business, and the future of several dozen jobs. Research and development improvements in air flow distribution and refrigeration coil technology contributed greatly to certifying Displaymor's showcases given the new federal regulations. These modifications resulted in a refrigerator case that will keep foods cooler, longer. Such changes maintained the openness of the display, critical to customer visibility and accessibility, impulse buying, and cross-merchandising.
Author
Certification; Commerce; Coolers; Display Devices; Manufacturing; Refrigerating; Refrigerators

20020076109 Swedish Defence Research Establishment, Stockholm, Sweden
Simulation with Jammed Terminally Guided Projectile ***Simulering av Stoerning mot Slutfasstyrd Granat.***
Andersson, U.; Tonnvik, A.; Apr. 2001; 94p; In Swedish
Report No.(s): PB2002-104679; FOI-R-0133-SE; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The effect of using multispectral waterfog (MWF) as a countermeasure against thermally guided projectiles has been studied using the simulation package called OPTSIM. Different parameter settings have been used to test the outcome of the duel between thermally guided projectiles and armoured vehicles using MWF. Simulations show that MWF can be an effective countermeasures against thermally guided projectiles. However, the probability for the projectiles to hit the target depends on how well the vehicle is covered by MWF and the surroundings.
NTIS
Computerized Simulation; Jamming; Precision Guided Projectiles; Multispectral Radar

20020076142 Kirby Co., Cleveland, OH USA
Improving Vacuum Cleaners
Spinoff 1997; 1997, pp. 81; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under a Space Act Agreement between the Kirby company and Lewis Research Center, NASA technology was applied to a commercial vacuum cleaner product line. Kirby engineers were interested in advanced operational concepts, such as particle flow behavior and vibration, critical factors to improve vacuum cleaner performance. An evaluation of the company 1994 home care system, the Kirby G4, led to the refinement of the new G5 and future models. Under the cooperative agreement, Kirby had

access to Lewis' holography equipment, which added insight into how long a vacuum cleaner fan would perform, as well as advanced computer software that can simulate the flow of air through fans. The collaboration resulted in several successes including fan blade redesign and continuing dialogue on how to improve air-flow traits in various nozzle designs.
Author
Air Flow; Cleaners; Computer Programs; Fan Blades; Nozzle Design; Vacuum

20020076155 Space, Energy, Time Savings Systems, Inc., Miami, FL USA
Tankless Water Heater
Spinoff 1997; 1997, pp. 82; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Kennedy Space Center specialists aided Space, Energy, Time Saving (SETS) Systems, Inc. in working out the problems they encountered with their new electronic "tankless" water heater. The flow switch design suffered intermittent problems. Hiring several testing and engineering firms produced only graphs, printouts, and a large expense, but no solutions. Then through the Kennedy Space Center/State of Florida Technology Outreach Program, SETS was referred to Michael Brooks, a 21-year space program veteran and flowmeter expert. Run throughout Florida to provide technical service to businesses at no cost, the program applies scientific and engineering expertise originally developed for space applications to the Florida business community. Brooks discovered several key problems, resulting in a new design that turned out to be simpler, yielding a 63 percent reduction in labor and material costs over the old design.
Author
Commerce; Design Analysis; Flowmeters; Switches; Technology Utilization; Water Heating

20020076258 NASA Langley Research Center, Hampton, VA USA
Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems
Noor, Ahmed K., Compiler, Old Dominion Univ., USA; July 2002; 453p; In English, 5-6 Mar. 2002, Hampton, VA, USA; Sponsored by Old Dominion Univ., USA; Also announced as 20020076259 through 20020076274; Original contains color illustrations
Contract(s)/Grant(s): RTOP 706-63-51-30
Report No.(s): NASA/CP-2002-211741; L-18216; NAS 1.55:211741; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

This document contains the proceedings of the Training Workshop on Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems held at NASA Langley Research Center, Hampton, Virginia, March 5 - 6, 2002. The workshop was jointly sponsored by Old Dominion University's Center for Advanced Engineering Environments and NASA. Workshop attendees were from NASA, other government agencies, industry, and universities. The objectives of the workshop were to give overviews of the diverse activities in hierarchical approach to material modeling from continuum to atomistics; applications of multiscale modeling to advanced and improved material synthesis; defects, dislocations, and material deformation; fracture and friction; thin-film growth; characterization at nano and micro scales; and, verification and validation of numerical simulations, and to identify their potential for future aerospace systems.
Author
Computerized Simulation; Scale (Ratio); Dislocations (Materials); Fracturing; Nanotechnology

20020076259 Old Dominion Univ., Center for Advanced Engineering Environments, Hampton, VA USA
Perspectives on Multiscale Modeling, Simulation and Visualization
Noor, Ahmed K., Old Dominion Univ., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 1-40; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

In recent years intense effort has been devoted to the modeling and simulations of physical phenomena occurring on a vast range of spatial and temporal length scales. Multiscale modeling and simulations are being used in fields as diverse as materials science, nano/microelectronics, environmental remediation, safe stewardship of nuclear weapons and biotechnology. This endeavor has prompted the development of multiscale modeling and simulation strategies, interrogative visualization facilities, as well as versatile and powerful software systems. An attempt is made in this overview to give broad definitions to the terms and to set the stage for the succeeding presentations. The presentation is divided into four parts. In the first part, examples of future aerospace systems are given, along with some of their major characteristics and the enabling technologies. The second part provides a brief overview of some aspects of multiscale modeling and simulation as one of the enabling technologies for future aerospace systems. The third part describes the future research and learning environments required for the realization of the full

potential of multiscale modeling and simulation. The fourth part lists the objectives of the workshop and some of the sources of information on multiscale modeling and simulation.
Author
Computerized Simulation; Models; Aerospace Systems; Learning; Scientific Visualization

20020076308 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands
Approximate Elastic Field in a Conducting, Non-Magnetic Cylindrical Shell in an Electromagnetic Field
Manea, T. E.; Verweij, M. D.; Blok, H.; Mar. 2001; 64p; In English
Report No.(s): PB2002-105939; ITS/EM-2001-08; Copyright; Avail: National Technical Information Service (NTIS)

Conducting bodies can move and/or can be deformed when they are subjected to strong electromagnetic fields. One of the practical applications of these phenomena is the electromagnetic forming, i.e. shaping objects using strong electromagnetic fields. Since the early 20th century this has been used at an industrial level. Due to its complexity, the approach of this subject is still not a trivial problem. The authors intend to develop simple analytical models of the electromagnetic and the elastic field in a circular cylindrical setup with an outer forming coil and an inner workpiece. Future experiments must reveal whether these models yield a good prediction of the real phenomena. If so, they may be used in more complex configurations.
NTIS
Electromagnetic Fields; Forming Techniques; Cylindrical Shells

20020076456 Pennsylvania State Univ., University Park, PA USA
Non-Incineration Treatment to Reduce Benzene and VOC Emissions from Green Sand Molding Systems
Cannon, F. S.; Voigt, R. C.; Jun. 28, 2002; 216p; In English
Report No.(s): DE2001-795738; DOE/ID/13719; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Final report describing laboratory, pilot scale and production scale evaluation of advanced oxidation systems for emissions and cost reduction in metal casting green sand systems.
NTIS
Sand Casting; Oxidation; Volatile Organic Compounds; Benzene

20020077959 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
A Pulse-Compression Method for Process Monitoring
Wu, N. Eva, Binghamton Univ., USA; Wang, Xiaoxia, Binghamton Univ., USA; [2000]; 4p; In English
Contract(s)/Grant(s): NCC1-336; NSF ECS-96-15956; HE-1321-98; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper describes, from a deterministic view point, an on-line process monitoring method for small signal behavior of time invariant stable systems at a given operating point. The monitoring is accomplished by using an consequence modulated low-pass wavelet as the probing signal, and a cyclic reference signal as the correlator. This method allows to achieve high resolution, high signal to noise ratio monitoring, and the acquired data can be used for on-line diagnosis.
Author
Pulse Compression; On-Line Systems; Signal Processing; Wavelet Analysis; Cross Correlation

20020077961 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. fuer Bauweisen- und Konstruktionsforschung, Stuttgart Germany
The Manufacture of Fibre Reinforced Structures Using a Modified Tape-Laying Process ***Herstellung von Faserverstaerkten Strukturen Mittels Modifizierter Bandlegetechnik***
Wunsch, Markus, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; 2001; ISSN 1434-8454; 134p; In German
Report No.(s): DLR-FB-2001-24; Copyright; Avail: Issuing Activity

Fibre reinforced plastics are widely used in the aerospace industry. Continuous tapes reinforced by carbon fibres are applied to flat surfaces. Several modifications to the tape-laying process are presented and discussed. The modifications include path planning, and changes to the design of the tape itself. During the process of laying unidirectional tape onto double curved surfaces, gaps and overlaps can occur. The avoidance of these gaps and overlaps is the aim of conventional strategies for path planning. The modified path planning strategy presented here, however, allows the presence of small gaps. This approach makes it possible to cover double curved surfaces. Areas in which the gaps would be too wide are identified as uncoverable, and it is suggested that patches can be fitted into these areas, Furthermore, a new design of tape is presented which is considerably more deformable than

unidirectional tape. Therefore a smaller number of uncoverable areas are identified during the path planning process than with unidirectional tape.
Author
Aerospace Industry; Fiber Composites; Manufacturing; Carbon Fiber Reinforced Plastics

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.

20020074271 Communications Research Lab., Japan
Data Analysis Methods for Radio-Transmitter Identification Based on the Transient Response: Basic Methods
Iwasaki, Ken, Communications Research Lab., Japan; Sugiyama, Tsutomu, Communications Research Lab., Japan; Shibuki, Masaaki, Communications Research Lab., Japan; Hirano, Takayuki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 155-173; In Japanese; Copyright; Avail: Issuing Activity

Three decades ago, transient fluctuations in carrier frequency at the moment when an FM press-to-talk transmitter was turned on were investigated from the viewpoint of interfering in adjacent channels or degrading the quality of its own channel. Considering that the fluctuation is a transient response of circuits to turning on a press-to-talk switch and this transient response reflects the design of the transmitter, lchino et al. suggested identifying the transmitter by analyzing the transient response of received signals at a monitoring station. A transient response is a non-stationary signal. Spectrogram representation is the most common and stable method for analyzing non-stationary signals. In this paper, we focus on the instantaneous frequency and spectrogram methods. Chapter 2 reviews the foundations of signal processing that are necessary for analyzing the transient response of FM transmitters. This chapter also gives the interpolation using zero-padding in both time and frequency domains. Chapter 3 first describes a chirp signal used for program verification, then describes the instantaneous frequency and spectrogram methods in detail, and finally gives their performances, i.e., through noise tolerance and resolutions in time/frequency domains. The instantaneous frequency method is applicable only in very low noise/interference environments because it is strongly influenced by such forces. Chapter 4 treats the results of applying the spectrogram method to data practically obtained in the laboratory using FM transmitters. A number of spectrograms are shown in the Appendix.
Author
Data Processing; Radio Transmitters; Carrier Frequencies; Noise Tolerance; Signal Processing

20020074366 Communications Research Lab., Japan
Transmitter Identification: Experimental Techniques and Results
Sugiyama, Tsutomu, Communications Research Lab., Japan; Shibuki, Masaaki, Communications Research Lab., Japan; Iwasaki, Ken, Communications Research Lab., Japan; Hirano, Takayuki, Communications Research Lab., Japan; Review of the Communications Review Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 131-147; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

We delineated the transient response patterns of several different radio transmitters in order to determine the patterns most useful in the development of a transmitter identification system. Using a high-speed data acquisition system, we first obtained rise and fall data for various transient response patterns that were produced by six different FM radio transmitters when the press-to-talk buttons were switched on and off. We next evaluated the effect of these transient patterns on the time domain and time-frequency spectrograms by measuring the changes in the receiver input level at Pin = -120 dBm and SNR = 7.2 dB obtained from three different bandwidths : 250, 50, and 12 kHz. Similarly, spectrogram analysis was used to obtain information about the relationship between bandwidth and noise. Comparison of the spectrogram patterns obtained in both laboratory and field experiments independently corroborated our results. However, the transient patterns in the time domain could not be used because of extensive distortion related to noise and interference from neighboring radio stations. These results suggest that spectrogram analysis of transient response patterns may be the most effective way to secure reliable identification of the FM radio transmitters.
Author
Transient Response; Radio Transmitters; Radio Frequency Interference; Data Acquisition

20020074368 Communications Research Lab., Japan

Transmitter Identification: The Development of a High-Speed Data Acquisition System with Receiving Functions

Shibuki, Masaaki, Communications Research Lab., Japan; Sugiyama, Tsutomu, Communications Research Lab., Japan; Iwasaki, Ken, Communications Research Lab., Japan; Hirano, Takayuki, Communications Research Lab., Japan; Suzuki, Akira, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 123-129; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

CRL (Communication Research Laboratory) has developed a system that improves the clarity of trigger settings used in the identification of FM radio transmitters. This method uses a hybrid system that consists of a trigger-based high-speed data acquisition system with receiving functions. This system enhances the ability to accurately identify FM radio transmitters via a narrow-band spectrum trigger system (NSTS) that mediates the variable transient response patterns the at occur when a press-to-talk button is switched on and off. to accomplish this, an NSTS unit was installed into a high-speed data acquisition system to elicit trigger settings that would provide discrete transmitter identification. This hybrid system was used to obtain rise and fall data from FM transmitters, and the transient response patterns were then analyzed. Experimental evaluation demonstrated that this method increases the dynamic range [receiver input level (Pin) = -70 to -110 dBm] and significantly reduces noise interference, making it possible to obtain more accurate transmitters identification

Author

Product Development; Data Acquisition; High Speed; Radio Transmitters; Data Transmission

20020074382 Booz-Allen and Hamilton, Inc., McLean, VA USA

Digital Modular Radio (AN/USC-61(V))

Draper, John; Nov. 2000; 17p; In English; Original contains color images

Report No.(s): AD-A404836; No Copyright; Avail: CASI; A03, Hardcopy

This briefing takes a look at the DMR mission and how DMR works. It also looks at the legacy equipment that is capable of being replaced by DMR.

DTIC

Pulse Communication; Radio Communication

20020074573 Secretary of the Air Force, Washington, DC USA

Command, Control, Communications, and Computer (C4) Systems

Cannon, Larry; Sep. 17, 1993; 7p; In English

Report No.(s): AD-A404885; AFPD33-1; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

No abstract.

DTIC

Information Systems; Command and Control; Telecommunication

20020074598 NASA Ames Research Center, Moffett Field, CA USA

Verbal and Non-Verbal Communication and Coordination in Mission Control

Vinkhuyzen, Erik, NASA Ames Research Center, USA; [1998]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

In this talk I will present some video-materials gathered in Mission Control during simulations. The focus of the presentation will be on verbal and non-verbal communication between the officers in the front and backroom, especially the practices that have evolved around a peculiar communications technology called voice loops.

Author

Verbal Communication; Mission Planning; Active Control

20020074599 Communications Research Lab., Japan

Transient Response Patterns for Identifying Radio Transmitters

Hirano, Takayuki, Communications Research Lab., Japan; Sugiyama, Tsutomu, Communications Research Lab., Japan; Shibuki, Masaaki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 149-154; In Japanese; Copyright; Avail: Issuing Activity

When a press-to-talk transmitter is switched on and off, specific transient patterns in the time domain and time-frequency space are seen for each model and transmitter. We defined the characteristics necessary to identify a radio transmitter and showed that the characteristics effective for identification differs from model to model.
Author
Transient Response; Radio Transmitters; Pattern Method (Forecasting)

20020074604 Communications Research Lab., Japan
Quantum Detection Circuit for Quantum Channel Coding
Sasaki, Masahide, Communications Research Lab., Japan; Mizuno, Jun, Communications Research Lab., Japan; Fujiwara, Mikio, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 101-112; In Japanese; Copyright; Avail: Issuing Activity

Light, main carrier in the present information technology, is electromagnetic wave, and also an ensemble of energy quanta, photon as well. At present only the fact is used that light propagates as an energy flux, and the wave nature of light is never used any more so far. Conventional information theory is readily capable of designing communication system based on the wave nature of light, and providing its performance limit. However the ultimate performance limit of optical communication is eventually given by the law of quantum mechanics that governs photon dynamics. Quantum channel capacity is then determined by the distinguishability of optical quantum states. In this article we consider one of the most basic quantum signal system, symmetric states of a single photon polarization, which is often used for quantum key distribution. It is clarified what is the maximum amount of information that can be extracted from that source and how one can implement the optimal detector for attaching it. Conventionally detection of polarization modulation signals is made by using a polarizer. For a single photon state, the binary output detection based on a polarizer is the standard measurement, which is called the von Neumann measurement. On the other hand the optimal solution in quantum information theory is given by the detector with three outputs at most regardless of the number of the signal components. This type of detector can be implemented by the polarization interferometer. We developed such a detector and could demonstrate the 96% of the predicted limit which is superior to the conventional von Neumann limit.
Author
Signal Detection; Optical Communication; Photons; Light (Visible Radiation); Information Systems; Flux Density

20020074778 Secretary of the Air Force, Washington, DC USA
Long-Haul Telecommunications Management
Apr. 17, 2002; 23p; In English
Report No.(s): AD-A404971; AFI33-116; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This revision updates the following paragraphs: Responsibilities, paragraph 2.; Procedures, paragraph 3.; System Specific Procedures, paragraph 4.; Obtaining Telecommunications Service Priority (TSP) for National Security Emergency Preparedness (NS/EP), paragraph 5.; and Accepting Long-Haul Telecommunications Service, paragraph 6. Added new paragraph 7. to summarize Information Collections, Records, and Forms pertinent to this publication.
DTIC
Management Information Systems; Telecommunication

20020074781 Secretary of the Air Force, Washington, DC USA
Communications and Information: Strategic Automated Command Control System-Data Transmission Subsystem (SACCS-DTS) Network Security Plan. Volume 3
Jun. 01, 1998; 16p; In English
Report No.(s): AD-A405155; AFI33-107-VOLUME-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This instruction implements Air Force Policy Directive (AFPD) 33-2, Information Protection. It prescribes detailed instructions for securely processing classified information on the SACCS-DTS (Strategic Automated Command Control System-Data Transmission Subsystem) Network. Compliance with all requirements of the network security plan is a condition of network accreditation. You must comply with all requirements in Chapter 2, Section 2C, and Chapter 3, Section 2C when beginning or ending classified processing. This instruction applies to all users of the SACCS-DTS network, either through direct input or interface systems.
DTIC
Data Transmission; Command and Control; Automatic Control; Communication Networks

20020074797 Secretary of the Air Force, Washington, DC USA

Communications and Information: Emission Security

May 01, 1998; 27p; In English; Supersedes AFI33-203, dated 1 Jan. 1997

Report No.(s): AD-A404986; AFI33-203; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Air Force EMSEC process has experienced many changes. Although these changes were attempts to meet the variances of a dynamic world, they require security protection measures far beyond the needs of the average user. In the past, EMSEC tended to stand alone; however, IP now requires a more balanced approach not only to the control of compromising emanations, NONSTOP, and HIJACK, but to communications security (COMSEC); COMPUSEC; and SATE as well. The prime objective of EMSEC is to identify requirements from the standpoint of IP risk management principles and provide the appropriate protection at the least possible, or no, cost. Key to this process is a partnership between the wing IP office and the use. The wing IP office assesses the need for EMSEC as part of IP; determines the required countermeasures; advises commanders of vulnerabilities, threats, and risks; and recommends a practical and feasible course of action to the wing commander. The user applies identified countermeasures. Air Force organizations and contractors doing business as the Air Force, whether procuring or using systems to process classified national security information, must apply EMSEC proportional to the threat of exploitation.

DTIC

Emission; Education; Computer Information Security

20020074799 Secretary of the Air Force, Washington, DC USA

Communications and Information: On-Hook Telephone Security Guidelines

Jul. 01, 1997; 205p; In English

Report No.(s): AD-A404984; AFM33-274; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Risk Associated with the Administrative Telephone System. The administrative telephone system which also includes facsimile machines and computer MODEMs has become so common place the tasks associated with its use are often overlooked. When present in sensitive discussion areas these devices pose a great threat to technical security. Often publications address various methods of securing intentional transmissions of information. The objective of this manual is to provide guidance for countering the threat posed by equipment utilizing the administrative telephone system when in an on-hook condition.

DTIC

Telephones; Security; Communication Networks

20020074801 Secretary of the Air Force, Washington, DC USA

Communications and Information: On-Hook Telephone Security

Mar. 01, 1997; 4p; In English

Report No.(s): AD-A404982; AFI33-220; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This instruction discusses the vulnerabilities of administrative telephone systems and outlines responsibilities for on-hook telephone security. It implements AFPD 33-2 and establishes security standards for installing and operating telephone systems in both classified and sensitive discussion areas.

DTIC

Security; Education; Telephones; Telecommunication

20020074803 Secretary of the Air Force, Washington, DC USA

Radio Frequency (RF) Spectrum Management

Apr. 03, 2002; 104p; In English; Original contains color images

Report No.(s): AD-A404980; AFM33-120-Rev; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

There are major changes to the Spectrum Certification Process (Chapter 2), Frequency Actions (Chapter 3), and the attachments. Chapter numbers and titles have changed; revisions have been applied to bring data up to date. Several former attachments have been updated and consolidated into Chapter 3. Standard frequency action format (SFAF) data items 511-513 are added to Chapter 3, Table 3.4. Other attachments have been moved into Chapter 4, Guidance for Specific Frequency Usage; there are additions such as the distance measuring equipment/ tactical air navigation (DME/TACAN) channels table. Significant changes occurred to FCC coordination (Chapter 4) and Attachment 2 is revised. Attachment 3, Frequency Assignments Security Classification Guide, has been expanded and updated. Tables have been added and/ or updated.

DTIC

Management Information Systems; Radio Frequencies

20020074804 Secretary of the Air Force, Washington, DC USA
Communications and Information: Telecommunications Monitoring and Assessment Program (TMAP)
May 23, 2002; 27p; In English; Supersedes AFI33-219, dated 15 May 2000
Report No.(s): AD-A404979; AFI33-219; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Telecommunications. The Air Force uses unsecured telecommunications systems such as telephones, cellular phones, radios, facsimile, pagers, computer networks, and other wired or wireless electronic devices to conduct day-to-day official business. Adversaries can easily monitor these unsecured systems that could provide information on military capabilities, limitations, intentions, and activities.
DTIC
Telecommunication; Education; Detection; Computer Information Security

20020074805 Secretary of the Air Force, Washington, DC USA
Communications and Information: Operational Instruction for the Secure Telephone Unit (STU-III) Type 1
Feb. 01, 1998; 46p; In English
Report No.(s): AD-A404995; AFI33-209; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No Abstract
DTIC
Education; Communication Networks; Computer Information Security

20020074816 Materials Research Society, Warrendale, PA USA
Symposium H: Materials Issues for Tunable RF and Microwave Devices III ***Final Report***
Tidrow, Steven; Horwitz, James; Levi, Jeremy; Xi, X. X.; Aug. 20, 2002; 3p; In English
Contract(s)/Grant(s): N00014-02-1-0540
Report No.(s): AD-A405026; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche
The purpose of the symposium was to bring together researchers from a broad range of disciplines to discuss the challenges facing the implementation of an affordable tunable RF and microwave device technology. Low cost, tunable microwave devices will have a tremendous impact on a variety of commercial and military systems, including, but not limited to, tunable band-select filters for wireless communications, phase shifters and true time delay devices for electronic scanning antennas, tunable radiating structures for frequency hopping, and tunable transformers to reduce RF impedance mismatch.
DTIC
Adaptive Control; Microwave Equipment; Beam Steering; Communication Equipment

20020074838 Secretary of the Air Force, Washington, DC USA
Compatibility, Interoperability, and Integration of Command, Control, Communications, and Computer (C4) Systems
Wilson, Wayn; Jul. 14, 1994; 17p; In English
Report No.(s): AD-A404898; AFI33-108; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract.
DTIC
Command and Control; Interoperability; Systems Compatibility; Systems Integration; Telecommunication

20020074884 Secretary of the Air Force, Washington, DC USA
Communications and Information: Electronic Messaging Registration and Authority
May 01, 1998; 8p; In English
Report No.(s): AD-A405138; AFI33-127; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
No abstract.
Author
Data Transmission; Message Processing; Electronic Mail

20020074885 Secretary of the Air Force, Washington, DC USA
Communications and Information: Electronic Messaging Registration
Holland, Robert F.; Mar. 01, 1997; 52p; In English
Report No.(s): AD-A405139; AFI33-128; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
No abstract.
Author
Data Transmission; Message Processing; Electronic Mail

20020074987 Secretary of the Air Force, Washington, DC USA
Weapons System Video Program
Apr. 30, 2001; 17p; In English
Report No.(s): AD-A404946; AFI33-132; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This Air Force Instruction (AFI) implements Department of Defense Directive (DoDD) 5040.4, Joint Combat Camera (COMCAM) Program, September 30, 1996, and Air Force Policy Directive (AFPD) 33-1, Command, Control, Communications, and Computer (C4) Systems. It also complements AFI 14-105, Unit Intelligence Mission and Responsibilities. It defines the Air Force Weapon Systems Video (WSV) program (formerly known as Armament Delivery Recording), whose primary purpose is to provide the combat air forces, unified commanders, and the national command authorities (NCA) with a visual record of aircraft weapons delivery, targeting, and accuracy. This instruction applies to commands whose flying units have operational capability taskings for combat missions and whose aircraft generate visual imagery of weapons delivery. It also applies to supporting commands that process this imagery. For the purpose of this AFI, the Air National Guard is considered a major command (MAJCOM). This instruction does not apply to maintenance and management of onboard cockpit sensor, video camera, or recording systems, nor does it outline criteria for operational analysis of imagery.
DTIC
Weapon Systems; Command and Control; Communication Networks; Education

20020074994 Secretary of the Air Force, Washington, DC USA
Preparing Official Communications
Nov. 01, 1999; 69p; In English
Report No.(s): AD-A404999; AFI33-326; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy
This manual states procedures for perparing communications in both manual and automated environments. Chapters cover stationery, memoranda, envelopes, and administrative communication, including appropriate style.
CASI
Management; Communication; Armed Forces (USA)

20020074995 Secretary of the Air Force, Washington, DC USA
Communications and Information: Air Force Specialized Information Assurance Publications
Jun. 01, 2000; 7p; In English
Report No.(s): AD-A404997; AFI33-206; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy
HQ AFCIC/SYI (Headquarters Air Force Communication and Information Center) exercises functional control over all Air Force information assurance publications for the Headquarters USA Air Force (HQ USAF/SC), and delegates management responsibility to HQ AFCA/GCI (Headquarters Air Force Communications Agency).
Derived from text
Management Information Systems; Computer Information Security

20020075023 Naval Research Lab., Washington, DC USA
Wireless Communication Technologies on ex-USS Shadwell
Street, Thomas T.; Nguyen, Xuan; Williams, Frederick W.; Jul. 31, 2002; 75p; In English
Contract(s)/Grant(s): N00014-97-C-2064; N00014-99-C-0033
Report No.(s): AD-A405185; NRL/MR/6180--02-8631; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche
'Wireless Communication Technologies' is a description of three state-of-the art, wireless communication systems that were installed and demonstrated on the ex-USS Shadwell, the Navy's full-scale test facility in Mobile, Alabama. The MicroLan RF

Tag and RSVP demonstration systems were developed for DARPA and the Office of Naval Research (ONR) Advanced Technology Demonstrators (ATD's) under Navy Contract NOOOl4-97-C-2064 and NOOO14-99-C-0033, respectively.
DTIC
Navy; Ships; Communication Networks

20020075032 Army Research Lab., Aberdeen Proving Ground, MD USA
Management of Tactical Ad Hoc Networks With C2 Data Models
Brand, John H.; Hartwig, George W.; Jul. 2002; 74p; In English
Report No.(s): AD-A405063; ARL-TR-2784; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The U.S. Army Research Laboratory is investigating the exploitation of preloaded reference data to solve problems in tactical network management by closely evaluating how communications networks are described in tactical database models such as the Joint Common Database (JCDB), information about the tactical situation can be used to help direct, or at least refine, the process of reconfiguring ad hoc networks. Because the structure of current networks closely follows organizational structures, the concept of Default Operational Organizations (DOO) is being used as a stating point for the evaluation. The DOO concept will be used to address the problem of managing internet protocol addresses in rapidly changing ad hoc organizations to minimize overhead traffic on congested, low-capacity networks. Reducing network loading and improving network response are very important to network centric weapon systems such as the Future Combat System Based on the data needs for network management, modifications to the IDEFiX database model representing the JCDB are proposed. A working model of an Access database based on a limited, notional test database using these modifications is described. This study has produced suggested modifications to the existing JCDB.DM that will enhance the ability to rapidly configure networks with reduced network management overhead.
DTIC
Computer Networks; Data Bases; Mathematical Models; Protocol (Computers)

20020075721 Alphatech, Inc., Burlington, MA USA
Fuselet Design and Implementation: A Practical Framework for the Creation of the Joint Battlespace Infosphere *Final Report, May 2001-Apr. 2002*
Jones, Eric; Krikeles, Basil; Reubenstein, Howawrd; Bostwick, Dan; Jun. 2002; 35p; In English; Original contains color images
Contract(s)/Grant(s): F30602-01-C-0082; AF Proj. 487B
Report No.(s): AD-A405042; AFRL-IF-RS-TR-2002-142; No Copyright; Avail: CASI; A03, Hardcopy

In this effort, two fuselet authoring tools were developed and incorporated in a demonstration system utilizing AFRL's Adaptive Sensor Fusion (ASF) technology for data communication and component encapsulation. Fuselet components created by the authoring tools fall into two categories: adaptor fuselets and correlator fuselets. These fuselets were demonstrated in the context of a Joint Battlespace Infosphere (JBI) operational scenario.
DTIC
Multisensor Fusion; Data Transmission; Communication Networks

20020075725 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA
Covariance Matrix Filtering for Adaptive Beamforming with Moving Interference
Newhall, Bruce K.; Jan. 1988; 5p; In English
Report No.(s): AD-A405193; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

An approach is developed for adaptive beamforming for mobile sonars operating in an environment with moving interference from surface shipping. It is assumed that the sound source of each ship is drawn from an ensemble of Gaussian random noise, but each ship moves at constant speed along a deterministic course. An analytic expression for the ensemble mean covariance is obtained. In practice the location, course, speed, mean noise level. and transmission loss of each interference are not known with sufficient precision to use the modeled ensemble mean as a basis for adaptive beamforming. The problem is thus to accurately estimate the ensemble mean based on data samples. The analytic ensemble mean is not stationary, and thus is not well estimated by the sample mean. The ensemble of covariance samples consists of rapidly varying random terms associated with the emitted noise and more slowly oscillating deterministic terms associated with the source and receiver motion. The non-stationary ensemble covariance mean can be estimated by filtering out the rapidly varying noise while retaining the slow oscillatory terms. Performance of the filters can be visualized and assessed in the 'epoch' frequency domain, the Fourier transform of the covariance samples. In this domain, higher bearing rates show up at higher frequencies. The traditional sample mean estimator retains only the zero frequency bin corresponding to stationary interference. Techniques that can identify and include the appropriate non-zero frequency contributions are better non-stationary estimators than the sample mean. Several such techniques are offered and compared. Simulations are invaluable in evaluating the filter performance, since the ensemble mean can be precisely calculated

analytically in the simulation, and compared directly with the sample estimates. Simulations of adaptive beamformers using co variance filtering will be shown to yield improved robustness to shipping motion.
DTIC
Signal Processing; Beamforming; Covariance; Submarines; Sonar; Random Noise; Detection

20020076093 National Defence Research Establishment, Dept. of Command and Control Warfare Technology, Linkoeping, Sweden
Tactical Radio Access Networks: A Comparison of Ad Hoc and Cellular Network Concepts
Hansson, A.; Nilsson, J.; Skoeld, M.; Sterner, U.; Mar. 2001; 52p; In English
Report No.(s): PB2002-105000; FOI-R-0086-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of the Tactical Radio Access Network (TRAN) project is to investigate and to propose radio access networks, geared to the needs of military tactical situations, and allowing for maximum use of civilian network technology and communication applications. For designing a TRAN, the authors consider two different system concepts. The first, called an ad hoc concept, is built on a distributed ad hoc network structure. The second, called a cellular concept, is based on the new UMTS Terrestrial Radio Access Network (UTRAN). This report is the final report in the first phase of the TRAN study and summarizes the outcome so far. The authors describe the two concepts and present a systematic comparison of them. In the second phase of the TRAN project the authors will focus on the cellular concept.
NTIS
Electronic Warfare; Communication Networks

20020076126 Communications Research Lab., Japan
Technologies of Millimeter-Wave Road-Vehicle Communications
Sato, Katsuyoshi, Communications Research Lab., Japan; Harada, Hiroshi, Communications Research Lab., Japan; Kojima, Fumihide, Communications Research Lab., Japan; Fujise, Masayuki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 107-117; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

In recent years interest in ITS (Intelligent Transport Systems) technology has been growing, because it is thought that ITS can solve problems such as traffic jams and traffic accidents. Communication between roadside base stations and vehicles is a critical element of an ITS. In this paper, we describe the road-vehicle communication (RVC) system using ROF technology and software radio. These systems can realize multimode service and high speed data transmission. We developed RVC system using ROF technology which can transmit three kind of services (ETC, PHS, BS) simultaneously. The software radio with small size for mobile terminal is also developed. The overview of these systems is shown. In addition, activities of YRP (Yokosuka Research Park) ITS Joint Research Group are shown.
Author
Radio Communication; Millimeter Waves; Telecommunication; Roads; Technologies

20020076133 Communications Research Lab., Japan
A Millimeter-Wave Video-Transmission System: Design and Performance for Indoor BS Signals Transmission
Hamaguchi, Kiyoshi, Communications Research Lab., Japan; Shoji, Yozo, Communications Research Lab., Japan; Ogawa, Hiroyo, Communications Research Lab., Japan; Hirachi, Yasutake, Communications Research Lab., Japan; Nishi, Seiji, Communications Research Lab., Japan; Kawakami, Eiichiro, Communications Research Lab., Japan; Suematsu, Eiji, Communications Research Lab., Japan; Iwasaki, Toshiya, Communications Research Lab., Japan; Akeyama, Akira, Communications Research Lab., Japan; Shimomichi, Youichi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 63-78; In Japanese; Copyright; Avail: Issuing Activity

The design and performance of a millimeter-wave video transmission system using 60-GHz band for indoor broadcasting-satellite (BS) signals transmission is presented. This system can transmit multiple video signals such as broadcasting signals and user-oriented signals to a television set indoors. to minimize the local oscillator's frequency offset and phase-noise effects, the system uses a remote-heterodyne scheme. Based on the concept, the system is developed to meet required carrier-to-noise- power-ratio and 3rd-order intermodulation. The BS transmission was experimentally done using the transmitter and receiver setup. The results are very promising and show the feasibility of the system.
Author
Broadcasting; Millimeter Waves; Video Signals; Performance Tests; Systems Engineering; Signal Transmission

20020076134 Communications Research Lab., Japan

156 Mbps Ultrahigh-Speed Wireless LAN Prototype in the 38 GHz Band

Wu, Gang, Communications Research Lab., Japan; Inoue, Masugi, Communications Research Lab., Japan; Murakami, Homare, Communications Research Lab., Japan; Hase, Yoshihiro, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 23-33; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

This paper describes a 156 Mbps ultrahigh-speed wireless LAN operating in the 38 GHz millimeter (mm)-wave band. The system is a third prototype developed at the Communications Research Laboratory since 1998. Compared with the previous prototypes, the system is faster (156 Mbps) and smaller (volume of radio transceiver less than 1000 cc), it has a larger service area (two overlapping basic service sets), and a longer transmission distance (the protocol can support a distance of more than two hundred meters). The development focuses on the physical layer and the data link control layer, and thus a GMSK-based mm-wave transceiver and an enhanced RS-ISMA (reservation-based slotted idle signal multiple access) protocol are key development components. This paper describes the prototype system's design, configuration, and implementation.

Author

Local Area Networks; Millimeter Waves; Prototypes; Systems Engineering; Transmitter Receivers; Wireless Communication

20020076135 Communications Research Lab., Japan

MIRAI Architecture for Heterogeneous Networks

Mizuno, Mitsuhiko, Communications Research Lab., Japan; Wu, Gang, Communications Research Lab., Japan; Havinga, Paul J. M., Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 9-22; In Japanese; Copyright; Avail: Issuing Activity

One of the keywords that describe next generation wireless communications is "seamless." As part of the e-Japan Plan promoted by the Japanese Government, the MIRAI (Multimedia Integrated network by Radio Access Innovation) project has, as its goal, the development of new technologies to enable seamless integration of various wireless access systems for practical use by the year 2005. This paper describes a heterogeneous network architecture including a common tool, a common platform, and a common access. In particular, software-defined radio technologies are used to develop a multi-service user terminal to access different wireless networks. The common platform for various wireless networks is based on a wireless supporting IPv6 network. A basic access network, separated from other wireless access networks, is used as a means for wireless system discovery, signaling, and paging. A proof-concept experimental demonstration system will be available in March, 2002.

Author

Communication Networks; Multimedia; Wireless Communication; Radio Communication; Software Engineering

20020076138 Communications Research Lab., Japan

A Millimeter-Wave Broadband Wireless Access System Using Mobile Tracking Technology

Tsuji, Hiroyuki, Communications Research Lab., Japan; Ogawa, Hiroyo, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 79-95; In English; Copyright; Avail: Issuing Activity

We describe a new system for high-speed wireless access systems between base stations and mobile terminals. In the proposed system, the base stations are located along street or in public facilities and formulate the antenna beam toward mobile terminals to utilize the millimeter wave efficiently. The base station has an array antenna and tracks mobile terminals by using a new tracking algorithm. A radio-on-fiber technique is used to simplify and miniaturize the components of the base station. We propose a new tracking algorithm that uses directions-of-arrival, angular velocities of mobile terminals, and scatter modeling in multipath communications channels to improve the tracking performance. We also developed experimental equipment to demonstrate the feasibility of the proposed millimeter-wave broadband wireless access system and the efficiency of the tracking algorithm using an array antenna system. Finally, we discuss our simulation and experimental results.

Author

Algorithms; Broadband; Millimeter Waves; Miniaturization; Multipath Transmission; Mobile Communication Systems; Tracking Networks

20020076154 KVH Industries, Inc., Middletown, RI USA

Satellite Antenna Systems

Spinoff 1997; 1997, pp. 61; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Through the Technology Affiliates Program at the Jet Propulsion Laboratory, the ACTS antenna system was transferred from experimental testing status to commercial development with KVH Industries, Inc. The ACTS design enables mobile satellite antennas to remain pointed at the satellite, regardless of the motion or vibration on which it is mounted. KVH's first product based on the ACTS design is a land-mobile satellite antenna system that will enable direct broadcast satellite television aboard moving trucks, recreational vehicles, trains, and buses. Future products could include use in broadcasting, emergency medical and military vehicles.
Author
Antenna Design; Industries; Satellite Antennas

20020076205 Communications Research Lab., Japan
A Study of Frequency Sharing and Contribution to ITU for Wireless Communication Systems Using Stratospheric Platforms
Oodo, Masayuki, Communications Research Lab., Japan; Miura, Ryu, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 49-62; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

R&D for wireless communication systems using aircraft called high altitude platform keeping at an altitude of about 20 km has been made progress as a national project in Japan since 1998. In order to realize such novel wireless communication systems, allocation and maintenance of available frequency bands are the key issues. At this stage, following three frequency bands are allocated for the communication systems using stratospheric platforms; 2 GHz bands for IMT-2000, 31/28 GHz bands for fixed service and 47/48 GHz bands for fixed service. Among these frequency bands, 31/28 GHz bands were proposed by Japan and the use of the bands was allowed in WRC-2000 as the results of the frequency sharing and compatibility studies with the other services in ITU-R. On the allocation, however, stringent conditions are imposed and there still remain a lot of further studies in order to deregulate these conditions. This paper describes the current status of the frequency sharing and compatibility studies between the stratospheric platform communication systems and other radio systems in the 31/28GHz bands in the International Telecommunication Union (ITU).
Author
Stratosphere; Wireless Communication; Telecommunication; Frequencies; Flight Altitude

20020076215 MicroMass Communications, Inc., Raleigh, NC USA
Individualized Communications
Spinoff 1997; 1997, pp. 101; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

IntelliWeb and IntelliPrint, products from MicroMass Communications, utilize C Language Integrated Production System (CLIPS), a development and delivery expert systems tool developed at Johnson Space Center. IntelliWeb delivers personalized messages by dynamically creating single web pages or entire web sites based on information provided by each website visitor. IntelliPrint is a product designed to create tailored, individualized messages via printed media. The software uses proprietary technology to generate printed messages that are personally relevant and tailored to meet each individual's needs. Intelliprint is in use in many operations including Brystol-Myers Squibb's personalized newsletter, "Living at Your Best," geared to each recipient based on a health and lifestyle survey taken earlier; and SmithKline Beecham's "Nicorette Committed Quitters Program," in which customized motivational materials support participants in their attempt to quit smoking.
Author
Computer Programs; Expert Systems; Websites

20020076216 Angle Linear, Lomita, CA USA
Improving Communications Systems
Spinoff 1997; 1997, pp. 116; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The Space Shuttle has many communications systems which are used throughout a typical mission. Given that the radio spectrum has become increasingly congested, the ability to hear extremely weak signals requires greater receiver sensitivity. Dryden Flight Research Center approached Angle Linear, a manufacturer of linear radio frequency products and peripherals for communications, to solve the problem. The solution was a receiving preamplifier specially crafted for NASA. Communications with the Space Shuttle are now more reliable,with Dryden being able to also support local missions without purchasing additional equipment. The work has carried over into the Mir Space Station communication support effort and is under evaluation by other NASA centers. The company's preamplifier line was greatly expanded to cover a broader range of frequencies, providing the same

sensational improvement to other areas of communication including business, government, trucking, land mobile, cellular and broadcast.
Author
Telecommunication; Spacecraft Communication; Radio Frequencies; Preamplifiers

20020076245 Communications Research Lab., Japan
R and D Program on Telecom and Broadcasting System Using High Altitude Platform Stations
Miura, Ryu, Communications Research Lab., Japan; Oodo, Masayuki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 35-48; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

Telecommunication and broadcasting systems using radio-relay/base stations on board the high altitude platforms are expected to create the largest business market among its possible applications. Telecommunications Advanced Organization (TAO) and Communications Research Laboratory (CRL) is conducting R&D on the telecom and broadcasting system to demonstrate its feasibility. Prototype onboard equipment and ground equipment are being developed on schedule in the fixed, mobile, and broadcasting services. The performance of them will be demonstrated and evaluated in the preliminary flight test planned in 2002 using a helicopter, a jet and a stratospheric unmanned solar plane, Pathfinder Plus, which was developed by NASA, before the flight test using the low-altitude powered test airship being developed by National Aerospace Laboratory.
Author
Broadcasting; High Altitude; Research and Development; Telecommunication; Platforms

20020076246 Communications Research Lab., Japan
Review of Bio-EMC Studies
Watanabe, Soichi, Communications Research Lab., Japan; Wake, Kanako, Communications Research Lab., Japan; Fukunaga, Kaori, Communications Research Lab., Japan; Yamanaka, Yukio, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 157-166; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

Biological aspects of electromagnetic compatibility (Bio-EMC) have been studied by EMC Research Group of CRL. There are two main subjects in the field. One is related to rules and regulations of electromagnetic-wave hazards, especially development of standard estimation methods of electromagnetic power deposited in human bodies exposed to microwaves from cellular telephones or VHF-band electromagnetic waves. Another is development of exposure setups for laboratory animals used in biological studies on health effects of electromagnetic waves and their dosimetry. Novel phantoms are also being developed in order to perform highly accurate dosimetry in above studies. It is expected that these studies contribute development of compliance tests for radiofrequency protection guidelines and improvement of rationale of those guidelines, which consequently provides safety environment including appropriate electromagnetic wave applications.
Author
Electromagnetic Compatibility; Electromagnetic Radiation; Radiation Measuring Instruments; Health Physics

20020076248 Communications Research Lab., Japan
An Advanced CATV System with Wireless Distribution
Tsuzuku, Aiichiro, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 119-124; In Japanese; Copyright; Avail: Issuing Activity

CATV(Community Antenna TV) has been started as a measure intended to improve the poor reception area since 1955 at the spa of Ikaho in Gunma prefecture. Recently CATV has come into the limelight as a multi program distributor and a new transmission media of the broadband Internet. The percentage of household CATV sets is 22% in 2000 in Japan. The wireless distributed CATV system is able to complement the wired system. It is serviceable in where the cable cannot lay, such as the area studded with houses or isolated island. In this paper, an advanced CATV system with wireless distribution is mentioned. The frequency band is the millimeter-wave band, because it has the characteristic of allowing broadband transmission and miniaturization of devices. The link budget of the test system using 60GHz band is also described.
Author
Wireless Communication; Television Systems; Cable Television; Miniaturization

20020076249 Communications Research Lab., Japan
Technologies of Millimeter-Wave Inter-Vehicle Communications: Propagation Characteristics
Kato, Akihito, Communications Research Lab., Japan; Sato, Katsuyoshi, Communications Research Lab., Japan; Fujise,

Masayuki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 97-106; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

In this paper, we introduce developed technologies for millimeter-wave inter-vehicle communication (IVC) system in intelligent transport systems (ITS), especially propagation characteristics of 60 GHz band for the system design of IVC. First we introduce the outline of an IVC system using millimeter wave and its research subjects. Next we show experimental results of propagation characteristics of radio wave at 60 GHz between running vehicles. The propagation model and mechanism of fading propagation are argued. The joint research activity of IVC system in Yokosuka Research Park (YRP) is also introduced.
Author

Millimeter Waves; Systems Engineering; Wave Propagation; Transport Vehicles; Technologies; Radio Communication

20020076307 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands

Computational Time-Domain Modeling of Electromagnetic Fields: A Novel Method for Handling Large, Source-Free, Homogeneous Domains

de Hoop, A. T.; Lager, I. E.; Nov. 2000; 12p; In English

Report No.(s): PB2002-106045; ITS/EM-2000-28; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

A computational method for handling the electromagnetic field in large, source-free homogeneous domains is proposed. In it, the causal resonator modes of the different sub-domains are taken as expansion functions. The relevant expansion coefficients are determined by a minimization of the discrepancy in the satisfaction of the continuity conditions at the non-void set of interfaces between domains with different constitutive properties, together with an appropriate handling of the excitation conditions.
NTIS

Electromagnetic Fields; Time Domain Analysis; Mathematical Models; Optimization

20020076324 New Hampshire Dept. of Transportation, Bureau of Materials and Research, Concord, NH USA

Enhancing Geotechnical Information with Ground Penetrating Radar ***Final Report***

Fish, M.; Lane, R.; Apr. 30, 2002; In English; This document is color dependent and/or in landscape layout. It is currenty only available on CD-ROM

Report No.(s): PB2002-107961; No Copyright; Avail: National Technical Information Service (NTIS)

A research project was initiated though State Planning and Research (SP&R) funding to learn how well ground penetrating radar (GPR) can supplement or replace conventional test borings. The objective of the research was to determine if GPR could distinguish between and accurately determine the depth to different soil layers, locate the bedrock surface, find and measure the extent of bedrock fractures and subsurface voids, and map river bottom profiles within different locations throughout New Hampshire. GPR investigations were conducted at locations between test borings or where test borings could not be taken because of time constraints or difficulties with drill rig access. to date, GPR has been used as a supplement to the conventional test borings or as a sole source of subsurface information on a total of seventeen geotechnical projects. This report discusses the use of GPR on eight of these seventeen projects and includes sites where GPR was very effective, moderately helpful and of little use. Techniques employed for using GPR, and how the results were calibrated and verified are included in this report.
NTIS

Geology; Ground Penetrating Radar

20020076334 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden

Development of Signal Measurement Equipment ***Utveckling av Signalmaetutrustning. SMU***

Gundmark, T.; Mar. 2000; 100p; In Swedish

Report No.(s): PB2002-107058; FOA-R-00-01449-616-SE; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

In the beginning of this decade FOA was assigned by the Swedish Armed Forces to start building competence in the area of Anti Radiation Missiles (ARM, Swedish: SSRB) in order to assess the threat of such weapon systems against its radar systems. The assessment is carried out by means of digital simulation models. It is necessary, though, that these models are supported by measured data, to give confidence to the results. At FOA, a measurement system, that in essential parts has the same characteristics as an ARM seeker has been developed. The system is airborne and stabilized. It can measure a radar signal by strength and direction with the same accuracy that an ARM seeker is expected to have. This is reported separately. This paper reports in detail the design of the signal measurement system, SMU, and is also a manual of the equipment.
NTIS

Digital Simulation; Homing Devices; Antiradiation Missiles; Signal Measurement

20020076337 National Defence Research Establishment, Dept. of Command and Control Warfare Technology, Linkoeping, Sweden

Impact of Different Interfering Signals on an MSK Receiver in Fading Environment

Wiklundh, K.; Dec. 1999; 48p; In English

Report No.(s): PB2002-107053; FOA-R-99-01344-504-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

When a radio receiver is located in the vicinity of other transmitters or electrical equipment, the radio system will suffer a performance degradation, due to the radiated electromagnetic interference. by approximating these interfering signals as additive white Gaussian noise (AWGN), the analysis of the system performance is considerably simplified. However, the consequences of using this approximation is not well documented in fading environment. Therefore, the Gaussian approximation is investigated for a radio system using minimum shift keying (MSK) modulation when, firstly, the desired signal is subjected to Rayleigh fading and, secondly, also the interference is faded. The approximation is studied for the interfering signal types: (1) an interfering MSK signal, (2) a continuous sine signal and (3) pulse modulated additive white Gaussian noise. In order to evaluate the usefulness of the approximation, the bit error probability of the system is calculated. It is shown that it is appropriate to approximate all chosen interfering signals as a Gaussian process with equal average power. This is valid both when the desired signal is Rayleigh fading and when the interference also is subjected to fading. Furthermore, the knowledge of whether the interference is subjected to Rayleigh fading or not, when the desired signal is faded, is found to not be critical for the results.

NTIS

Electromagnetic Interference; Radio Receivers; Electric Equipment

20020076359 Swedish Defence Research Establishment, Sensor Technology, Linkoeping Sweden

Circular Array for Aerostat Radar: A Preliminary Study ***Cirklaer Gruppantenn foer Aerostatradar. En Inledande Studie***

Pettersson, L.; Oct. 2001; In Swedish; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-106222; FOI-R-0245-SE; No Copyright; Avail: National Technical Information Service (NTIS)

A concept with possible broadband cylindrical array antenna, to be placed inside an aerostat, is studied with the purpose to assess the realizability, preliminary design and performance. Future work needed for its realization is also suggested. Constraints affecting the result are the size of the aerostat, maximum number of channels, movements of the aerostat in wind, system bandwidth, etc.

NTIS

Antenna Arrays; Airships; Radar Antennas; Antenna Design; Cylindrical Antennas

20020076364 Swedish Defence Research Establishment, Stockholm, Sweden

Implementation of an Intersystem Interference Model in ELSA Software Demonstrator ***Implementering av en Telekomfliktmodell i Mjulvarudemonstration ELSA***

Fors, K.; Jul. 2001; In Swedish; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-106807; FOI-R-0166-SE; No Copyright; Avail: National Technical Information Service (NTIS)

Because of the increased use of civilian electronics in military applications during the last decade, the risk of intersystem interference is also increasing. This is due to the fact that civilian electronics produce a higher level of interference when compared to military electronics. A software demonstrator tool, ELSA, has been developed at FOI to simulate and graphically illustrate the amplification characteristics of receiver in different directions depending on the deployment of own systems and hostile jammers. FOI is currently interested in studying the effects of the interference on the antenna beam pattern. For this purpose, an intersystem interference module has been implemented in ELSA. The work included three main parts. The first was to make the function that calculated the power that receiver detected from COTS. The second was to enable entry of parameters in the intersystem interference module window, and the last was to implement the graphic to illustrate the effect that COTS has on the antenna pattern. The results from four different simulated scenarios shows that an intersystem interference has effect on the antenna beam pattern.

NTIS

Electromagnetic Interference; Antenna Radiation Patterns; Amplification; Radiation Distribution

20020076368 Defence Science and Technology Organisation, Electronics and Surveillance Research Lab., Edinburgh, Australia

Sea Air Gap Agent

Clark, David, Defence Science and Technology Organisation, Australia; April 2002; 49p; In English

Report No.(s): DSTO-TR-1304; DODA-AR-012-311; Copyright; Avail: Issuing Activity

This document describes the implementation of intelligent agents in a distributed surveillance simulation exercise. Agent Oriented Systems provided the agent framework known as JACK. The synthetic environment includes STAGE, which provides the physical domain simulation, the DSTO DICE simulation software, which is designed to provide command and control representation and an in-house developed prototype planning function for optimization of surveillance plans.
Author
Computerized Simulation; Applications Programs (Computers); Aircraft Detection; Command and Control; Decision Making; Surveillance; Military Operations

20020076387 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands
Analysis of Transient Radiation of a (Traveling) Current Pulse on a Straight Wire Segment
Quak, D.; Mar. 2001; 12p; In English
Report No.(s): PB2002-105940; ITS/EM-2001-09; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The transient electromagnetic radiation from an electric current pulse traveling along a straight wire segment of finite length is investigated. Explicit time-domain expressions are given for the components of the emitted electromagnetic field anywhere in space in their dependence on the position of observation, the location and the length of the wire segment, and the travel speed and the pulse shape of the electric current. Numerical results are presented for a number of cases for two types of standard EMC pulses.
NTIS
Electric Current; Electromagnetic Radiation; Wire; Numerical Analysis; Electromagnetic Pulses

20020076413 National Telecommunications and Information Administration, Washington, DC USA
Video Quality Measurement Techniques
Wolf, S.; Pinson, M.; Jun. 2002; In English
Report No.(s): PB2002-108368; NTIA-02-392; No Copyright; Avail: National Technical Information Service (NTIS)
Objective metrics for measuring digital video performance are required by Government and industry for specification of system performance requirements, comparison of competing service offerings, service level agreements, network maintenance, and optimization of the use of limited network resources such as transmission bandwidth. to be accurate, digital video quality measurements must be based on the perceived quality of the actual video being received by the users of the digital video system rather than the measured quality of traditional video test signals (e.g., color bar). This is because the performance of digital video systems is variable and depends upon the dynamic characteristics of both the original video (e.g., spatial detail, motion) and the digital transmission system (e.g., bit rate, error rate). The goal of this report is to provide a complete description of the ITS video quality metric (VQM) algorithms and techniques. The ITS automated objective measurement algorithms provide close approximations to the overall quality impressions, or mean opinion scores, of digital video impairments that have been graded by panels of viewers.
NTIS
Quality Control; Video Communication; Digital Techniques

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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.

20020074616 NASA Ames Research Center, Moffett Field, CA USA
Nanoscale Etching and Indentation of Silicon Surfaces with Carbon Nanotubes
Dzegilenko, Fedor N., MRJ Technology Solutions, Inc., USA; Srivastava, Deepak, MRJ Technology Solutions, Inc., USA; Saini, Subhash, NASA Ames Research Center, USA; [1998]; 1p; In English; Sixth Foresight Conference on Molecular Nanotechnology, 12-15 Nov. 1998, Santa Clara, CA, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only
The possibility of nanolithography of silicon and germanium surfaces with bare carbon nanotube tips of scanning probe microscopy devices is considered with large scale classical molecular dynamics (MD) simulations employing Tersoff's reactive many-body potential for heteroatomic C/Si/Ge system. Lithography plays a key role in semiconductor manufacturing, and it is expected that future molecular and quantum electronic devices will be fabricated with nanolithographic and nanodeposition

techniques. Carbon nanotubes, rolled up sheets of graphene made of carbon, are excellent candidates for use in nanolithography because they are extremely strong along axial direction and yet extremely elastic along radial direction. In the simulations, the interaction of a carbon nanotube tip with silicon surfaces is explored in two regimes. In the first scenario, the nanotubes barely touch the surface, while in the second they are pushed into the surface to make ”nano holes”. The first - gentle scenario mimics the nanotube-surface chemical reaction induced by the vertical mechanical manipulation of the nanotube. The second -digging - scenario intends to study the indentation profiles. The following results are reported in the two cases. In the first regime, depending on the surface impact site, two major outcomes outcomes are the selective removal of either a single surface atom or a surface dimer off the silicon surface. In the second regime, the indentation of a silicon substrate by the nanotube is observed. Upon the nanotube withdrawal, several surface silicon atoms are adsorbed at the tip of the nanotube causing significant rearrangements of atoms comprising the surface layer of the silicon substrate. The results are explained in terms of relative strength of C-C, C-Si, and Si-Si bonds. The proposed method is very robust and does not require applied voltage between the nanotube tips and the surface. The implications of the reported controllable etching and hole-creating for nanolithography on silicon are discussed in detail.
Author
Nanofabrication; Lithography; Carbon Nanotubes; Semiconductors (Materials); Molecular Dynamics; Simulation

20020074789 Army Research Lab., Adelphi, MD USA
Angular Superresolution for a Scanning Antenna with Simulated Complex Scatterer-Type Targets
Ly, Canh; May 2002; 49p; In English
Contract(s)/Grant(s): Proj-PE61102A
Report No.(s): AD-A404823; ARL-TR-1486; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Scan-MUSIC (MUltiple Signal Classification), or SMUSIC, algorithm was developed by the Millimeter Wave Branch, Sensors and Electron Devices Directorate, Army Research Laboratory (ARL). The algorithm improves angular resolution for target detection with the use of a single rotatable sensor scanning in an angular region of interest. This algorithm has been adapted and extended from the MUSIC algorithm that has been used for a linear sensor array. Experimental and computer simulation results have resolved two closely spaced point targets that exhibited constructive interference, but not for the targets that exhibited destructive interference. The interferences occurred due to the relative phases of their returned signals. Therefore, there were some limitations of the algorithm for the point targets. In this paper, I extend the application of the SMUSIC algorithm to a problem of complex scatterer-type targets, which is more useful and of greater practical interest. The SMUSIC simulation results show that the algorithm can resolve centroids of the complex scatterer-type targets in which they are close together within the beamwidth of a Ka radar antenna with frequency diversification. to make it easier to see the results of the simulation and to demonstrate the SMUSIC algorithm for the complex scatterer-type targets, I developed a graphical interface tool to run and analyze the SMUSIC algorithm. The tool, which is written in the MATLAB language, allows an end user to analyze the performance of the SMUSIC algorithm by entering a combination of parameters necessary for the simulation.
DTIC
Scanning; Angular Resolution; Antennas

20020074819 Materials Research Society, Warrendale, PA USA
Progress in Semiconductor Materials for Optoelectronic Applications Symposium held in Boston, Massachusetts on November 26-29, 2001
Jones, Eric D.; Manasreh, Omar; Choquette, Kent D.; Friedman, Daniel J.; Johnstone, Daniel K.; Jan. 2002; 716p; In English; For individual articles, see ADP012585 thru ADP012685
Contract(s)/Grant(s): F49620-01-1-0347; N00014-01-1-0649
Report No.(s): AD-A405047; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

InGaAsP/InP multiple quantum wells have been prepared by Impurity-Free Vacancy Disordering (IFVD). The luminescent characteristics was investigated using photoluminescence (PL) and photoreflectance (PR), from which the band gap blue shift was observed. SiN4, SiO2 and SOG were used for the dielectric layer to create the vacancies. All samples were annealed by rapid thermal annealing (RTA). The results indicate that the band gap blue shift varies with the dielectric layers and annealing temperature. The SiO2 capping was successfully used with an InGaAs cladding layer to cause larger band tuning effect in the InGaAs/InP MQWs than the Si3N4 capping with an InGaAs cladding layer. On the other hand, samples with the SiN4-InP cap layer combination also show larger energy shifts than that with SiO2-InP cap layer combination.
DTIC
Electro-Optics; Semiconductors (Materials); Infrared Detectors; Quantum Dots; Quantum Wells; Dielectrics

20020074851 NASA Marshall Space Flight Center, Huntsville, AL USA

Test Platform for Advanced Digital Control of Brushless DC Motors (MSFC Center Director's Discretionary Fund) ***Final Report***

Gwaltney, D. A., NASA Marshall Space Flight Center, USA; August 2002; 30p; In English

Contract(s)/Grant(s): Proj. 00-04

Report No.(s): NASA/TM-2002-211917; M-1055; NAS 1.15:211917; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A FY 2001 Center Director's Discretionary Fund task to develop a test platform for the development, implementation. and evaluation of adaptive and other advanced control techniques for brushless DC (BLDC) motor-driven mechanisms is described. Important applications for BLDC motor-driven mechanisms are the translation of specimens in microgravity experiments and electromechanical actuation of nozzle and fuel valves in propulsion systems. Motor-driven aerocontrol surfaces are also being utilized in developmental X vehicles. The experimental test platform employs a linear translation stage that is mounted vertically and driven by a BLDC motor. Control approaches are implemented on a digital signal processor-based controller for real-time, closed-loop control of the stage carriage position. The goal of the effort is to explore the application of advanced control approaches that can enhance the performance of a motor-driven actuator over the performance obtained using linear control approaches with fixed gains. Adaptive controllers utilizing an exact model knowledge controller and a self-tuning controller are implemented and the control system performance is illustrated through the presentation of experimental results.

Author

Digital Systems; Control Systems Design; Adaptive Control; Electric Motors; Actuators; Proportional Control; Mathematical Models

20020076016 Argonne National Lab., IL USA

Advanced Photon Source linac modulators PSpice simulation and upgrade.

Cours, A.; Smith, T.; Jun. 28, 2002; 4p; In English

Report No.(s): DE2001-795847; ANL/ASD/CP-108093; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The APS linac modulators provide DC pulses to Thales 35/45-MW klystrons. The modulators are pulse forming network (PFN)-type pulsers with EMI 40-kV switch-mode charging supplies. The PFN consists of two 8-cell lines connected in parallel. EEV CX1836A thyratrons are used as discharge switches. The PSpice simulation of the modulators using OrCAD release 9.1 made it possible to find appropriate parameters of RC circuits that reduce high-frequency ringing of the pulse transformer primary voltage. In order to improve pulse top flatness (originally (+-)3%), new coils were built and installed. The coils allow discrete tuning of pulse waveforms by changing the amount of used turns. The advantage of two parallel-line PFN configurations was also used. An equivalent method using a low-voltage generator was used for PFN fine tuning.

NTIS

Switches; Voltage Generators; Linear Accelerators; Modulators

20020076043 Tennessee Univ., Center for Clean Products and Clean Technologies, Knoxville, TN USA

Printed Wiring Board Surface Finishes. Cleaner Technologies Substitutes Assessment, Volume 2, Appendices

Geibig, J. R.; Swanson, M. B.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-108680; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this questionnaire is to collect data that will be used in preparation of a Design for the Environment (DFE) Alterative Surface Technologies report. This report will present an analysis and evaluation of the risk, performance, and costs associated with operating each of the alternative surface finish processes. Much of this report will be based on data submitted by Printed Wiring Board (PWB) manufacturing facilities.

NTIS

Surface Finishing; Environments; Technology Assessment; Circuit Boards; Manufacturing

20020076091 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden

Radar Absorbing Materials: An Overview ***Radarabsorberande Material en Oeversikt.***

Ousbaeck, J. O.; Larsson, F.; Dec. 2000; 36p; In Swedish

Report No.(s): PB2002-104666; FOA-R-00-01543-615-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The report presents an overview of radar absorbing materials. A number of different types of basic radar absorbers are presented and their reflection properties are compared. A theoretical model used to calculate the reflection and transmission

coefficients of planar radar absorbing structures is described and a number of calculation results are presented. The report also gives a survey of some basic materials such as fiber reinforced plastic.
NTIS
Antiradar Coatings; Radar Absorbers

20020076115 HRL Labs., LLC, Malibu, CA USA
Advanced High Electron Mobility Transistor (HEMT) Monolithic Millimeter-Wave Integrated Circuit (MMIC) Circuits for Millimeter- and Submillimeter-Wave Power Sources
Samoska, Lorene; Peralta, Alejandro; May 2002; 7p; In English; Presented at the Far Infrared, Submillimeter and Millimeter Detector Technology Workshop, Monterrey, CA, 1 Apr. 2002. Prepared in collaboration with Jet Propulsion Lab., Pasadena, CA
Contract(s)/Grant(s): F33615-99-C-1512; Proj-ARPS
Report No.(s): AD-A405094; AFRL-SN-WP-TP-2002-102; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper focuses on InP-based, HEMT Monolithic Millimeter-wave Integrated Circuit (MMIC) power amplifiers for applications to heterodyne receivers, transmitters, and communication circuits. Recently, JPL has developed several HEMT MMIC circuits using HRL Laboratories' 0.1 micrometer InP HEMT technology with unprecedented high frequency performance and output power. Results include an 80 OHz bandwidth power amplifier to 145 GHz, a 15-25 mW amplifier to 170 GHz and a HEMT active doubler to 300 GHz, the highest frequency HEMT doubler circuit reported to date. Included here is a description of the design and testing of the circuits, and a discussion of the methods used in measuring MMICs above 200 UHz. These circuits are particularly useful in local oscillators for heterodyne receivers at THz frequencies.
DTIC
High Electron Mobility Transistors; Integrated Circuits; Millimeter Waves; Submillimeter Waves; Heterodyning

20020076132 Power Efficiency Corp., Hackensack, NJ USA
Voltage Controller
Spinoff 1997; 1997, pp. 92; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Power Efficiency Corporation, specifically formed to manufacture and develop products from NASA technology, has a license to a three-phase power factor controller originally developed by Frank Nola, an engineer at Marshall Space Flight Center. Power Efficiency and two major distributors, Performance Control and Edison Power Technologies, use the electronic control boards to assemble three different motor controllers: Power Commander, Performance Controller, and Energy Master. The company Power Factor Controller reduces excessive energy waste in AC induction motors. It is used in industries and applications where motors operate under variable loads, including elevators and escalators, machine tools, intake and exhaust fans, oil wells, conveyors, pumps, die casting, and compressors. Customer lists include companies such as May Department Stores, Caesars Atlantic City, Ford Motors, and American Axle.
Author
Power Factor Controllers; Motors; Electric Potential; Fabrication

20020076136 Communications Research Lab., Japan
Recent Progress of Studies on EMC Relating to Various Equipments
Yamanaka, Yukio, Communications Research Lab., Japan; Ishigami, Shinobu, Communications Research Lab., Japan; Harima, Katsushige, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 143-155; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

In order to realize the further development of the advanced information society, R&D in EMC technologies between electric, electronic and communication equipment and/or systems are indispensable. The target of the EMC is to promote the electromagnetic environment in which those equipment can be used without mutual interference. In this paper, recent EMC studies on various equipment in CRL are explained. CRL/EMC group mainly focus its research area on measurement method. Research outline and outcome on some topics are summarized which include the radiated emission measurement method above 1 GHz, GTEM cell and reverberation chamber which are promising measuring instruments for both radiated emission measurement and radiated immunity measurement in the near future.
Author
Electromagnetic Compatibility; Measuring Instruments; Communication Equipment; Electronic Equipment

20020076137 Communications Research Lab., Japan

Research Project on Millimeter-Wave Semiconductor Devices

Matsui, Toshiaki, Communications Research Lab., Japan; Shinohara, Keisuke, Communications Research Lab., Japan; Higashiwaki, Masataka, Communications Research Lab., Japan; Hirose, Nobumitsu, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 125-132; In Japanese; Copyright; Avail: Issuing Activity

Putting millimeter-wave communications system in to use, it is crucial to improve communication devices efficiency and to minimize their size. In our institute, we focus on millimeter-wave semiconductor devices due to develop millimeter-wave communication technology which can be adapted to various applications. Our result was shown by achieving cutoff frequency 472 GHz, the world fastest at this moment. Following manuscript, we shall introduce our research project including InP and nitride compound semiconductor devices, Si-Ge semiconductor devices, Si-CMOS integrated circuit and SiN passivation film using hot-wire CVD process.

Author

CMOS; Millimeter Waves; Semiconductor Devices; Radio Communication; Wireless Communication

20020076163 Tennessee Univ., Center for Clean Products and Clean Technologies, Knoxville, TN USA

Printed Wiring Board Surface Finishes. Cleaner Technologies Substitutes Assessment, Volume 1

Geibig, J. R.; Swanson, M. B.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-108876; No Copyright; Avail: National Technical Information Service (NTIS)

The Printed Wiring Board Surface Finishes Cleaner Technologies Substitutes Assessment: Volume 1 is a technical document that presents comparative risk, competitiveness, and resource requirements information on six technologies for performing the surface finishing function during printed wiring board (PWB) manufacturing. Surface finishing technologies are used by PWB manufacturers to deposit a coating on the outside surfaces of the PWB that provides a solderable surface for future assembly, while also protecting the surface from contamination. The technologies evaluated include hot air solder leveling (HASL), electroless nickel/immersion gold (nickel/gold), electroless nickel/immersion palladium/immersion gold (nickel/palladium/gold), organic solderability preservative (OSP), immersion silver, and immersion tin. Volume I describes the surface finishing technologies, methods used to assess the technologies, and Cleaner Technologies Substitutes Assessment (CTSA) results. Volume II contains appendices, including detailed chemical properties and methodology information.

NTIS

Cleaners; Printed Circuits; Surface Finishing; Manufacturing; Technology Assessment

20020076187 Fermi National Accelerator Lab., Batavia, IL USA

Radiation tolerance of prototype BTeV pixel detector readout chips

Chiodini, G.; Jul. 12, 2002; 7p; In English

Report No.(s): DE2001-796948; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

High energy and nuclear physics experiments need tracking devices with increasing spatial precision and readout speed in the face of ever-higher track densities and increased radiation environments. The new generation of hybrid pixel detectors (arrays of silicon diodes bump bonded to arrays of front-end electronic cells) is the state of the art technology able to meet these challenges. We report on irradiation studies performed on BTeV pixel readout chip prototypes exposed to a 200 MeV proton beam at Indiana University Cyclotron Facility. Prototype pixel readout chip preFPIX2 has been developed at Fermilab for collider experiments and implemented in standard 0.25 micron CMOS technology following radiation tolerant design rules. The tests confirmed the radiation tolerance of the chip design to proton total dose up to 87 MRad. In addition, non destructive radiation-induced single event upsets have been observed in on-chip static registers and the single bit upset cross section has been extensively measured.

NTIS

Pixels; Chips (Electronics); Radiation Tolerance; High Energy Interactions; Cyclotrons

20020076247 Communications Research Lab., Japan

Research on Millimeter-Wave Communication Devices Including Test and Measurement Technique

Matsui, Toshiaki, Communications Research Lab., Japan; Kiyokawa, Masahiro, Communications Research Lab., Japan; Yasuda, Hiroaki, Communications Research Lab., Japan; Li, Keren, Communications Research Lab., Japan; Review of the Communications Research Laboratory; December 2001; ISSN 0914-9260; Volume 47, No. 4, pp. 133-141; In Japanese; Copyright; Avail: Issuing Activity

The CRL Millimeter-wave Device Group undertakes research to develop technologies for creating millimeter-wave (MMW) wireless communication devices with high performance and practicality. Such devices are essential for use in future MMW communication systems and for their dissemination to the public. This research program addresses the development of high performance MMW circuit components and innovation in MMW radio device construction. These activities are to be pursued in conjunction with the outcome of the concurrently undertaken Semiconductor Device Research program. Our research and development of MMW device technologies has the aim of establishing key technologies for widespread use of the millimeter-wave frequency spectrum and enabling the features required for practical use - compactness, lightweight, high-performance, and low cost. Testing and measurement methods are also addressed under this program as essential techniques in developing MMW communication devices. This report outlines our program on MMW communication device technologies. Author

Millimeter Waves; Telecommunication; Wireless Communication; Semiconductor Devices; Research and Development

20020076386 Research Inst. of National Defence, Div. of Sensor Technology, Linkoeping, Sweden

Model Calculations of Rough Surfaces: Adjusted to Reflection Measurement on Colour Samples ***Modellberaekningar foer Skrovliga ytor: Anpassade till Reflektansmaetningar pa Faergprover***

Forssell, G.; Mar. 2000; 29p; In Swedish

Report No.(s): PB2002-106294; FOA-R-00-01478-615-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Model Calculations have been performed, using parameter curve adjustments to measured BRDF-curves. Also a reflection model has been used, which uses geometrical optics, to calculate the reflectance of rough surfaces and then adjusting these to measured reflectance curves. The adjustments are good, but cannot explain the interference peaks that appear in the measured curves due to a periodical structure in the surface roughness.

NTIS

Surface Roughness; Reflectance; Geometrical Optics; Camouflage

20020076419 National Energy Technology Lab., Pittsburgh, PA USA

Alternating current losses in ag-sheathed bscco (2212 and 2223) tapes and wires and ybco (123) coated conductors

Hurley, J. S.; Jan. 01, 2000; 24p; In English

Report No.(s): DE2001-795776; FG26-98FT40098--01; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this study, we focus on the examination of ac losses in conductors utilizing Bi(sub 2)SR(sub 2)Ca(sub 2)Cu(sub 3)O (BSCCO (2223)) high TC superconductors (HTS). In addition, we seek to assist other facilities such as the University of Wisconsin-Madison Applied Superconductivity Center (UW-ASC), Brookhaven National Laboratory, and other DoE facilities investigating the use of HTS in electric power applications (e.g., generators, motors, and transformers). to accomplish this we will develop an ac losses capability at Clark Atlanta University to complement the established ac losses efforts at Brookhaven National Laboratory (BSCCO) on BSCCO/Ag and various material characterization efforts taking place at the UW-ASC. Our goal is through this effort to gain a greater understanding of the effects on ac losses due to parameters such as ac/dc current, J(sub c), tape geometry, voltage tap placement, field orientation, material anisotropy, surface irregularities, percolations and filament coupling effects. As a result, we expect to better understand how to minimize ac losses in applications requiring real or practical conductors. HTS conductors based on BSCCO-2223 are now being routinely produced in industrial lengths of high quality. Vendors such as Southwire and ASC are producing multi-filamentary tapes in lengths of 6 km or more carrying critical current densities of up to 3 kA/cm**2 at 77 K. While this is approaching the level of performance where some large-scale applications are considered to be economically viable, a number of problems remain to be solved. The remaining issues include: rapid reduction in JC in magnetic fields; and power dissipation due to varying magnetic fields or currents (ac losses).

NTIS

Alternating Current; Superconductivity; Energy Dissipation

20020076454 NASA Marshall Space Flight Center, Huntsville, AL USA

Apparatus for Generating Thrust Using a Two Dimensional, Asymmetrical Capacitor Module

Campbell, Jonathan W., Inventor, NASA Marshall Space Flight Center, USA; Jun. 25, 2002; 6p; In English; Continuation-in-part of US-Patent-Appl-SN-520817, filed on Mar. 8, 2000

Patent Info.: Filed 20 Sep. 2001; NASA-Case-MFS-31611-1-CIP; US-Patent-6,411,493; US-Patent-Appl-SN-961552; US-Patent-Appl-SN-520817; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An asymmetrical capacitor module for generating thrust includes two conductive elements of similar but different geometries separated by a dielectric member. Improved embodiments provided in the construction of conductive elements of smaller axial

extent include those where the element is formed by an annular wire or a dielectric supported ring. Other embodiments concern the dielectric member and involve changes in the extent and shape thereof.
Official Gazette of the U.S. Patent and Trademark Office
Asymmetry; Capacitors; Dielectrics; Thrust

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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.

20020074572 Naval Postgraduate School, Monterey, CA USA
A Multidisciplinary Algorithm for the 3-D Design Optimization of Transonic Axial Compressor Blades
Jones, James A., Jr; Jun. 2002; 184p; In English; Original contains color images
Report No.(s): AD-A404896; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

A new, multidisciplinary algorithm for the CFD design optimization of turbomachinery blades is presented. It departs from existing techniques in that it uses a simple, previously-developed Bezier geometry representation (BLADE-3D) that can be easily manipulated to achieve true 3-D changes in blade shape. The algorithm Incorporates zero and first-order optimization techniques including sensitivity analyses and one-dimensional search methodology. It features an iterative finite element structural analysis as well as a cold shape correction procedure to ensure that the resulting blade meets steady-stress structural requirements. The process was applied to two different transonic tan designs -the Sanger rotor designed for the NPS Turbomachinery Laboratory and NASA Rotor 67, otherwise known as the 'NASA Fan'. The optimization objectives for the two designs were mass flow rate and polytropic efficiency respectively. Results for the Sanger rotor effort yielded an 8.1% improvement in mass flow rate, a 5% improvement in total pressure ratio, and a 0.9% increase in adiabatic efficiency. Application to the NASA Fan resulted in a 2.5% increase in polytropic efficiency. The results validate the utility of the BLADE-3D Bezier geometry package for use in future development of automated optimization routines for turbomachinery blade design.
DTIC
Algorithms; Compressor Blades; Computational Fluid Dynamics; Design Optimization; Three Dimensional Flow; Rotor Blades (Turbomachinery)

20020074618 NASA Ames Research Center, Moffett Field, CA USA
Experimental Study of Lift-Generated Vortices
Rossow, Vernon J., NASA Ames Research Center, USA; Aug. 18, 1998; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

The flow fields of vortices, whether bouyancy-driven or lift-generated, are fascinating fluid-dynamic phenomena which often possess intense swirl velocities and complex time-dependent behavior. As part of the on-going study of vortex behavior, this paper presents a historical overview of the research conducted on the structure and modification of the vortices generated by the lifting surfaces of subsonic transport aircraft. It is pointed out that the characteristics of lift-generated vortices are related to the aerodynamic shapes that produce them and that various arrangements of surfaces can be used to produce different vortex structures. The primary purpose of the research to be described is to find a way to reduce the hazard potential of lift-generated vortices shed by subsonic transport aircraft in the vicinity of airports during landing and takeoff operations. It is stressed that lift-generated vortex wakes are so complex that progress towards a solution requires application of a combined theoretical and experimental research program because either alone often leads to incorrect conclusions. It is concluded that a satisfactory aerodynamic solution to the wake-vortex problem at airports has not yet been found but a reduction in the impact of the wake-vortex hazard on airport capacity may become available in the foreseeable future through wake-vortex avoidance concepts currently under study. The material to be presented in this overview is drawn from aerospace journals that are available publicly.
Author
Vortex Avoidance; Wakes; Flow Distribution; Takeoff

20020074837 Massachusetts Inst. of Tech., Dept. of Ocean Engineering, Cambridge, MA USA
Investigation into the Discrepancies Between Computational Fluid Dynamic Lift Predictions and Experimental Results
Fairman, Randall S.; Jun. 2002; 118p; In English
Report No.(s): AD-A404875; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

An analysis of current computational fluid dynamics capabilities in predicting mean lift forces for two dimensional foils is conducted. It is shown that both integral boundary layer theory and Reynolds Averaged Navier Stokes algorithms provide the same over-prediction of lift forces when properly converged. It is also shown that the over-prediction is insensitive to turbulence model details. Experimentation and computational fluid dynamics modeling show that discrete vortices are shed with significant sizes and distinct frequencies. These vortices are shown to result in significant cfd prediction errors when they are asymmetric in size or shape. Inaccuracies in flow predictions in the near wake appear to result in an effective change in the Kutta Condition due to pressure biasing associated with vortex asymmetry. The net result is a consistent overprediction of mean lift. Based on an analysis of over 1000 historical experiments an empirical model is developed to allow the error in predicted lift coefficient to be anticipated based on the local flow conditions at the trailing edge of the foil. A series of experiments are conducted and reported to test the accuracy of the empirical model. The result is a significant improvement in mean lift prediction and pressure profile for both RANS and IBLT.
DTIC
Computational Fluid Dynamics; Life (Durability); Mathematical Models; Experimentation; Data Acquisition

20020074872 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Analysis of Carbon Nanotube Pull-out from a Polymer Matrix ***Final Report***
Frankland, S. J. V., Institute for Computer Applications in Science and Engineering, USA; Harik, V. M., Institute for Computer Applications in Science and Engineering, USA; July 2002; 13p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211743; NAS 1.26:211743; ICASE-2002-23; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Molecular dynamics (MD) simulations of carbon nanotube (NT) pull-out from a polymer matrix are carried out. As the NT pull-out develops in the simulation, variations in the displacement and velocities of the NT are monitored. The existence of a carbon-ring-based period in NT sliding during pull-out is identified. Linear trends in the NT velocity-force relation are observed and used to estimate an effective viscosity coefficient for interfacial sliding at the NT/polymer interface. As a result, the entire process of NT pull-out is characterized by an interfacial friction model that is based on a critical pull-out force, and an analog of Newton's friction law used to describe the NT/polymer interfacial sliding.
Author
Molecular Dynamics; Carbon Nanotubes; Fiber Pullout; Polymer Matrix Composites; Viscosity

20020074874 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Lateral Migration and Rotational Motion of Elliptic Particles in Planar Poiseuille Flow ***Final Report***
Qi, Dewei, University of Western Michigan, USA; Luo, Li-Shi, Institute for Computer Applications in Science and Engineering, USA; Aravamuthan, Raja, University of Western Michigan, USA; Strieder, William, Notre Dame Univ., USA; July 2002; 19p; In English; Original contains color illustrations; Sponsored in part by National Computational Science Alliance and Pittsburgh Supercomputing Center
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211661; NAS 1.26:211661; ICASE-2002-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Simulations of elliptic particulate suspensions in the planar Poiseuille flow are performed by using the lattice Boltzmann equation. Effects of the multi-particle on the lateral migration and rotational motion of both neutrally and non-neutrally buoyant elliptic particles are investigated. Low and intermediate total particle volume fraction f(sub a) = 13%, 15%, and 40% are considered in this work.
Author
Laminar Flow; Suspensions; Boltzmann Transport Equation; Rotation; Particulates; Ellipsoids

20020074882 Air Force Research Lab., Materials and Manufacturing Directorate, Tyndall AFB, FL USA
Dense Non-Aqueous Phase Liquid (DNAPL) Physical Modeling Study
Newman, Mark; Hayworth, Joel S.; Stauffer, Thomas B.; Jul. 2002; 40p; In English; Original contains color images; --Original contains color plates: All DTIC reproductions will be in black and white. Prepared in cooperation with Univ. of Florida, Gainsville, FL and Applied Research Assoc., Inc., Panama City, FL
Contract(s)/Grant(s): Proj-1900
Report No.(s): AD-A405136; AFRL-ML-TY-TR-2002-4547; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document presents the results of a physical modeling study performed at the Air Force Research Laboratory (AFRL) between June 6, 1996 and September 6, 1997 by a multidisciplinary team comprised of University of Florida (UF), Applied Research Associates, Inc. (ARA), and AFRL researchers. This study investigated the dissolution behavior of dense non-aqueous phase liquids (DNAPLs) in three-dimensional flow systems under controlled laboratory conditions.
DTIC
Physical Properties; Ground Water; Water Pollution; Contamination; Three Dimensional Flow

20020074898 Air Force Research Lab., Edwards AFB, CA USA
Supercritical and Transcritical Shear Flows in Microgravity: Experiments and Direct Numerical Simulation
Jul. 2002; 11p; In English
Report No.(s): AD-A405100; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
No abstract.
Author
Direct Numerical Simulation; Pressure Vessels; Supercritical Flow

20020074979 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Error Estimation and Uncertainty Propagation in Computational Fluid Mechanics *Final Report*
Zhu, J. Z., Academia Sinica, China; He, Guowei, Institute for Computer Applications in Science and Engineering, USA; July 2002; 14p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211744; NAS 1.26:211744; ICASE-IR-41; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Numerical simulation has now become an integral part of engineering design process. Critical design decisions are routinely made based on the simulation results and conclusions. Verification and validation of the reliability of the numerical simulation is therefore vitally important in the engineering design processes. We propose to develop theories and methodologies that can automatically provide quantitative information about the reliability of the numerical simulation by estimating numerical approximation error, computational model induced errors and the uncertainties contained in the mathematical models so that the reliability of the numerical simulation can be verified and validated. We also propose to develop and implement methodologies and techniques that can control the error and uncertainty during the numerical simulation so that the reliability of the numerical simulation can be improved.
Author
Error Analysis; Mathematical Models; Solid Mechanics; Direct Numerical Simulation; Computational Fluid Dynamics

20020074983 Academy of Sciences (USSR), Inst. of Chemical Physics, Moscow, USSR
International Workshop: New Models and Hydrocodes for Shock Wave Processes in Condensed Matter Held in Edinburgh, Scotland on 19-24 May, 2002
Klimenko, Vladimir Y.; May 24, 2002; 199p; In English
Contract(s)/Grant(s): N68171-01-M-6177
Report No.(s): AD-A405049; R/D-9218-AN-03; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche
The proceedings include papers presented on the following topics: impact effects and tests, including void formation and Taylor impact; numerical and computational fluid dynamics simulation; energy exchange; equations of state; shock propagation and effects; and shock induced chemical reactions.
CASI
Mathematical Models; Shock Waves; Hydrodynamics; Detonation Waves; Condensed Matter Physics; Conferences

20020075050 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Multiple-Relaxation-Time Lattice Boltzmann Models in 3D *Final Report*
dHumieres, Dominique, Ecole Normale Superieure, France; Ginzburg, Irina, Fraunhofer Inst. fuer Techno- und Wirtschaftsmathematik, Germany; Krafczyk, Manfred, Technische Univ., Germany; Lallemand, Pierre, Paris-Sud Univ., France; Luo, Li-Shi, Institute for Computer Applications in Science and Engineering, USA; July 2002; 18p; In English
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211660; NAS 1.26:211660; ICASE-2002-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This article provides a concise exposition of the multiple-relaxation-time lattice Boltzmann equation, with examples of fifteen-velocity and nineteen-velocity models in three dimensions. Simulation of a diagonally lid-driven cavity flow in three dimensions at Re=500 and 2000 is performed. The results clearly demonstrate the superior numerical stability of the multiple-relaxation-time lattice Boltzmann equation over the popular lattice Bhatnagar-Gross-Krook equation.
Author
Boltzmann Transport Equation; Numerical Stability; Cavity Flow

20020075051 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Force Evaluation in the Lattice Boltzmann Method Involving Curved Geometry ***Final Report***
Mei, Renwei, Florida Univ., USA; Yu, Dazhi, Florida Univ., USA; Shyy, Wei, Florida Univ., USA; Luo, Li-Shi, Institute for Computer Applications in Science and Engineering, USA; July 2002; 28p; In English
Contract(s)/Grant(s): NAS1-97046; NSF EEC-94-02989; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211662; NAS 1.26:211662; ICASE-2002-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The present work investigates two approaches for force evaluation in the lattice Boltzmann equation: the momentum-exchange method and the stress-integration method on the surface of a body. The boundary condition for the particle distribution functions on curved geometries is handled with second order accuracy based on our recent works. The stress-integration method is computationally laborious for two-dimensional flows and in general difficult to implement for three-dimensional flows, while the momentum-exchange method is reliable, accurate, and easy to implement for both two-dimensional and three-dimensional flows. Several test cases are selected to evaluate the present methods, including: (i) two-dimensional pressure-driven channel flow; (ii) two-dimensional uniform flow past a column of cylinders; (iii) two-dimensional flow past a cylinder asymmetrically placed in a channel (with vortex shedding); (iv) three-dimensional pressure-driven flow in a circular pipe; and (v) three-dimensional flow past a sphere. The drag evaluated by using the momentum-exchange method agrees well with the exact or other published results.
Author
Boundary Conditions; Distribution Functions; Two Dimensional Flow; Vortex Shedding; Three Dimensional Flow; Channel Flow

20020075055 General Electric Co., Research and Development Center, Schenectady, NY USA
Heat Transfer in a Complex Trailing Edge Passage for a High Pressure Turbine Blade, Part 1, Experimental Measurements
Bunker, Ronald S., General Electric Co., USA; Wetzel, Todd G., General Electric Co., USA; Rigby, David L., QSS Group, Inc., USA; Aug. 22, 2000; 7p; In English; ASME Turbo Expo 2002, 3-6 Jun. 2002, Amsterdam, Netherlands; Sponsored by American Society of Mechanical Engineers, USA; Original contains color illustrations
Contract(s)/Grant(s): SAA3-260; DE-FC21-95MC-31176
Report No.(s): GT-2002-30212-Pt-1; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A combined experimental and computational study has been performed to investigate the detailed heat transfer coefficient distributions within a complex blade trailing edge passage. The experimental measurements are made using a steady liquid crystal thermography technique applied to one major side of the passage. The geometry of the trailing edge passage is that of a two-pass serpentine circuit with a sharp 180-degree turning region at the tip. The upflow channel is split by interrupted ribs into two major subchannels, one of which is turbulated. This channel has an average aspect ratio of roughly 14:1. The spanwise extent of the channel geometry includes both area convergence from root to tip, as well as taper towards the trailing edge apex. The average section Reynolds numbers tested in this upflow channel range from 55,000 to 98,000. The tip section contains a turning vane near the extreme comer. The downflow channel has an aspect ratio of about 5:1, and also includes convergence and taper. Turbulators of varying sizes are included in this channel also. Both detailed heat transfer and pressure distribution measurements are presented. The pressure measurements are incorporated into a flow network model illustrating the major loss contributors.
Author
High Pressure; Turbine Blades; Trailing Edges; Heat Transfer Coefficients; Computational Fluid Dynamics; Thermography; Flow Distribution

20020075558 Armtec Defense Products Co., Coachella, CA USA
Pressure Wave Mitigation through the Use of an Ullage Minimization Device
Mutascio, Enrico, Armtec Defense Products Co., USA; Thornton, Michael, Naval Surface Warfare Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 69-78; In English; Also announced as 20020075551; Copyright;

Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Under the Naval Surface Fire Support (NSFS) program, the Indian Head Division, Naval Surface Warfare Center (NSWCIHD) is developing a 5-inch (127mm) propelling charge to launch a 110 pound (50 kg) Extended Range Guided Munition (ERGM) at 13.276 million ft-lbf (18 MJ) muzzle energy while not exceeding 65,000 psi (448 Mpa) chamber pressure. Development of the NSFS system has shown that the rear folding fins of the ERGM introduce an excessive amount of initial chamber volume which is leading to unacceptable pressure wave activity during the interior ballistic cycle, that has the potential to damage the ERGM electronic package as well as the gun weapon system. to help combat the chamber volume/pressure wave issue, ARMTEC Defense Products Company has designed and manufactured ullage minimization devices that are positioned between the rear folding fins of the ERGM projectile. These devices reduce initial chamber volume, reduce pressure wave activity and if manufactured from combustible material would provide additional energy to the NSFS system.

Author

Pressure Reduction; Wave Degradation; Combustion; Weapon Systems

20020075566 NASA Glenn Research Center, Cleveland, OH USA

Glenn-HT: The NASA Glenn Research Center General Multi-Block Navier-Stokes Heat Transfer Code

Gaugler, R. E., NASA Glenn Research Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 171-178; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

For the last several years, Glenn-HT, a three-dimensional (3D) Computational Fluid Dynamics (CFD) computer code for the analysis of gas turbine flow and convective heat transfer has been evolving at the NASA Glenn Research Center. The code is unique in the ability to give a highly detailed representation of the flow field very close to solid surfaces in order to get accurate representation of fluid heat transfer and viscous shear stresses. The code has been validated and used extensively for both internal cooling passage flow and for hot gas path flows, including detailed film cooling calculations and complex tip clearance gap flow and heat transfer. In its current form, this code has a multiblock grid capability and has been validated for a number of turbine configurations. The code has been developed and used primarily as a research tool, but it can be useful for detailed design analysis. In this paper, the code is described and examples of its validation and use for complex flow calculations are presented, emphasizing the applicability to turbomachinery for space launch vehicle propulsion systems.

Author

Computational Fluid Dynamics; Computer Programs; Three Dimensional Models; Gas Turbines; Gas Flow; Gas Dynamics

20020075570 Army Research Lab., Aberdeen Proving Ground, MD USA

Radiation Transfer Modeling in Electrothermal Chemical (ETC) Ignition

Kappen, Klaus, Army Research Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 247-257; In English; Also announced as 20020075551

Contract(s)/Grant(s): DAAH04-96-C-0086; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The use of plasma ignition for high-performance guns has been pursued at several levels. As part of the program at ARL we are attempting to define the role of the broadband electromagnetic radiation that is a key energy component of the plasma discharge. In particular, this effort is developing a radiation transfer model that will be incorporated into the CFD model of plasma ignition. This effort will allow more physically realistic characterization of the energy transfer in the plasma and its interaction with the propellant in the models. The present paper summarizes the physical background of the radiation transport, and the validation of the different sub-modules by use of published data will be presented. Current efforts are the coupling of the radiation model to the ARL NSRG2 code for the plasma-propellant interaction (PPI) simulation. Furthermore a series of laboratory experiments will be performed to validate the CFD code with incorporated radiation transport sub-model.

Author

Electromagnetic Radiation; Plasma Jets; Radiation Transport; Models; Computational Fluid Dynamics

20020075572 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA

CFD Model of the Plasma Efflux Generated by an ETC Igniter: Characterization of Propellant Surface Conditions

Nusca, Michael J., Army Research Lab., USA; Anderson, William R., Army Research Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 279-297; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

The Army Research Laboratory (ARL) is investigating the Electrothermal-Chemical (ETC) gun concept. As part of this program, the ARL has undertaken a comprehensive study of the interaction of the plasma efflux from an ETC igniter with solid

propellant. The goal of this work is to elucidate the physical, mechanical, and chemical mechanisms that underlie observed ballistic effects in ETC guns such as significant performance gains and reduced ignition delay. This paper describes the modeling effort in support of the plasma-propellant interaction project. A time-accurate computational fluid dynamics (CFD) code is developed that includes high-temperature thermodynamics, variable specific heats and transport properties (viscosity and thermal conductivity), and finite-rate chemical kinetics. Validation of this code utilizes a series of experiments involving the open-air firing of an ETC igniter generating an unsteady plasma flow field that impinges on an instrumented plate. Other experiments involve the firing of an ETC igniter into closed chambers in which a single propellant sample or multiple propellant disks are placed. Computer simulations of these experiments reveal gas dynamic and chemical details of the plasma jet as it mixes with air and interacts with the propellant, representing a unique model of the ETC plasmas.
Author
Computational Fluid Dynamics; Igniters; Efflux; Propellant Properties; Solid Propellants; Surface Properties; Interactions

20020075591 Sierra Engineering, Inc., Carson City, NV USA
Swirl Coaxial Injector Development, Part 1, Test and Results
Muss, J. A., Sierra Engineering, Inc., USA; Johnson, C. W., Sierra Engineering, Inc., USA; Cohn, R. K., Air Force Research Lab., USA; Strakey, P. A., Air Force Research Lab., USA; Bates, R. W., Air Force Research Lab., USA; Talley, D. G., Air Force Research Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 493-505; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Sierra Engineering, in conjunction with the Air Force Research Laboratory Propulsion Directorate, has undertaken a program to develop a gas-centered swirl coaxial injector. This injector design will be used in the multielement Advanced Fuels Testbed (AFT) engine for testing a variety of hydrocarbon propellants. As part of this program, a design methodology is being developed that will be applicable to future injector design efforts. The methodology combines cold flow data, acquired in the AFRL High Pressure Injector Flow facility, uni-element hot fire data, collected in AFRL Test Cell EC-1, and a computational effort conducted at University of Alabama-Birmingham, to identify key design features and sensitivities. Results from the computational effort will be presented in the Part II companion paper. Three different gas-centered swirl coaxial element concepts were studied: a converging design, a diverging design, and a pre-filming design. The cold flow experiments demonstrated that all three classes of elements produced an extremely dense, solid cone spray, with the highest mass density in the center. The atomization of all of these injectors was excellent, producing mean drop sizes 1/3 to 1/4 of that typically measured for shear coaxial elements operating under similar conditions. Uni-element hot fire testing of these elements has begun, but the elements have not yet been tested at the design operating conditions. Preliminary low chamber pressure test results show the converging design performs better than the pre-filming and diverging design Uni-element C* efficiencies in excess of 90% have been measured over a wide-range of mixture ratios.
Author
Fabrication; Performance Tests; Evaluation; Injectors; Coaxial Nozzles; Engine Tests; Atomizing

20020075592 Alabama Univ., Mechanical Engineering Dept., Birmingham, AL USA
Swirl Coaxial Injector Development, Part 2, CFD Modeling
Cheng, G. C., Alabama Univ., USA; Johnson, C. W., Sierra Engineering, Inc., USA; Muss, J. A., Sierra Engineering, Inc., USA; Cohn, R. K., Air Force Research Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 507-518; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Injector design is critical to obtaining the dual goals of long engine life as well as providing high energy release efficiency in the main combustion chamber. Introducing a swirl component in the injector flow can enhance the propellant mixing and thus improve engine performance. A combined experimental and computational effort is underway to examine the properties of GOX-centered, swirl coaxial injectors to examine their performance and lifetime characteristics. These injectors can be easily manufactured and can be designed to maintain a low face temperature, which will improve engine life. Therefore, swirl coaxial injectors, which swirl liquid fuel around a gaseous oxygen core, show promise for the next generation of high performance staged combustion rocket engines utilizing hydrocarbon fuels. The purpose of this work is to not only examine the properties of these injectors, but also to develop a design methodology, utilizing a combination of high-pressure cold-flow testing, uni-element hot-fire testing, and computations to create a high performing, long life swirl coaxial injector for multi-element combustor use. Several swirl coax injector configurations designed and fabricated by Sierra Engineering have been tested at the Edwards AFB Research site of the Air Force Research Laboratory Propulsion Directorate. An integral part of this effort is the use of computational fluid dynamics (CFD) analyses to both gain insight into the flowfield to improve our understanding of the underlying flow characteristics of this injector, as well as to help determine the ability of CFD to provide this. Both cold-flow and

hot-fire analyses were completed, but only the cold flow results are presented and discussed in this paper. The FDNS-RFV CFD code was employed, with the homogeneous real-fluid model selected to simulate the spray combustion phenomena for both the cold flow and hot fire conditions. Initial results show that large-scale phenomenology was predicted well by the cold-flow CFD analysis. Analyses and test comparisons will be presented and an assessment of the utility of the analyses will be discussed. More details of the experimental results can be found in the Part I companion paper.
Author
Coaxial Nozzles; Injectors; Fabrication; Rocket Engines; Phenomenology; High Temperature Environments; High Pressure; Computational Fluid Dynamics; Combustion Physics

20020075593 Sandia National Labs., Combustion Research Facility, Livermore, CA USA
Large Eddy Simulation of Cryogenic Injection Processes at Supercritical Pressure
Oefelein, Joseph C., Sandia National Labs., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 565-575; In English; Also announced as 20020075551
Contract(s)/Grant(s): NASA Order H-33477-D; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

This paper highlights results from the first of a series of hierarchical simulations aimed at assessing the modeling requirements for application of the large eddy simulation technique to cryogenic injection and combustion processes in liquid rocket engines. The focus is on liquid-oxygen-hydrogen coaxial injectors at a condition where the liquid-oxygen is injected at a subcritical temperature into a supercritical environment. For this situation a diffusion dominated mode of combustion occurs in the presence of exceedingly large thermophysical property gradients. Though continuous, these gradients approach the behavior of a contact discontinuity. Significant real gas effects and transport anomalies coexist locally in colder regions of the flow, with ideal gas and transport characteristics occurring within the flame zone. The current focal point is on the interfacial region between the liquid-oxygen core and the coaxial hydrogen jet where the flame anchors itself.
Author
Combustion Physics; Cryogenics; Gas Jets; Injectors; Liquid Propellant Rocket Engines; Thermophysical Properties; Simulation; Vortices

20020075594 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
An All-Pressure Fluid-Drop Model: Validation and Species System Dependency
Bellan, J., Jet Propulsion Lab., California Inst. of Tech., USA; Harstad, K., Jet Propulsion Lab., California Inst. of Tech., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 577-590; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

A fundamental and very general model of fluid drop behavior at all pressures is presented and is shown to reproduce microgravity experimental data for heptane drops in nitrogen. In the model, the existence of a drop surface (i.e. phase discontinuity) is not necessarily assumed. The optical drop diameter is defined as the location of the maximum density-gradient magnitude. An examination of the drop-diameter-squared variation with time for the heptane/nitrogen system shows that it is approximately linear only at atmospheric pressure and has a negative curvature at higher pressures. As the pressure increases, the slope of the diameter squared becomes an increasing function of time and progressively increases with pressure at subcritical far-field temperatures, however, at supercritical temperatures a maximum is reached. A similar investigation conducted for oxygen drops in hydrogen reveals that at higher then atmospheric pressure the slope of the diameter squared versus time has a positive curvature. Given that the drop diameter squared versus time exhibits different behavior with pressure for the two species systems, it is concluded that high-pressure behavior should not be extrapolated from one species system to another. The results also show that, independent of the species system, at locations arbitrarily near the boundary, the drop does not reach the mixture critical point within the range of conditions investigated. An examination of the relaxation time at the drop boundary shows that quasi-steadiness of the mass transfer prevails even for relatively small drops. On an appropriate scale, the slope of the diameter squared versus time is shown to be independent of the drop size at all pressures.
Author
Drop Size; Fluid Flow; Models; Hydrogen; Microgravity; Mass Transfer

20020075595 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Aspects of Supercritical Turbulence: Direct Numerical Simulation of O2/H2 and C7H16/N2 Temporal Mixing Layers
Bellan, J., Jet Propulsion Lab., California Inst. of Tech., USA; Okongo, N. A., Jet Propulsion Lab., California Inst. of Tech., USA; Harstad, K. G., Jet Propulsion Lab., California Inst. of Tech., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 591-604; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy.,

Suite 202, Columbia, MD 21044-3200 HC

Results from Direct Numerical Simulations of temporal, supercritical mixing layers for two species systems are analyzed to elucidate species-specific turbulence aspects. The two species systems, O2/H2 and C7HG16/N2, have different thermodynamic characteristics; thus, although the simulations are performed at similar reduced pressure (ratio of the pressure to the critical pressure), the former system is dose to mixture ideality and has a relatively high solubility with respect to the latter, which exhibits strong departures from mixture ideality Due to the specified, smaller initial density stratification, the C7H16/N2 layers display higher growth and increased global molecular mixing as well as larger turbulence levels. However, smaller density gradients at the transitional state for the O2/H2 system indicate that on a local basis, the layer exhibits an enhanced mixing, this being attributed to the increased solubility and to mixture ideality. These thermodynamic features are shown to affect the irreversible entropy production (i.e. the dissipation), which is larger for the O2/H2 layer and is primarily concentrated in high density-gradient magnitude regions that are distortions of the initial density stratification boundary. In contrast, the regions of largest dissipation in the C7H16/N2 layer are located in high density-gradient magnitude regions resulting from the mixing of the two fluids.
Author

Turbulence; Direct Numerical Simulation; Oxygen; Hydrogen; Nitrogen

20020075670 Argonne National Lab., IL USA

Shock waves generated by high-pressure fuel sprays directly imaged by x-radiography.

Wang, J.; MacPhee, A.; Powell, C. F.; Yue, Y.; Narayanan, S.; Dec. 20, 2001; 6p; In English

Report No.(s): DE2001-795820; ANL/UPD/CP-106497; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Synchrotron x-radiography and a novel fast x-ray detector are used to visualize the detailed, time-resolved structure of the fluid jets generated by a high pressure diesel-fuel injection. An understanding of the structure of the high-pressure spray is important in optimizing the injection process to increase fuel efficiency and reduce pollutants. It is shown that x-radiography can provide a quantitative measure of the mass distribution of the fuel. Such analysis has been impossible with optical imaging due to the multiple-scattering of visible light by small atomized fuel droplets surrounding the jet. In addition, direct visualization of the jet-induced shock wave proves that the fuel jets become supersonic under appropriate injection conditions. The radiographic images also allow quantitative analysis of the thermodynamic properties of the shock wave.
NTIS

Mass Distribution; Shock Waves; Quantitative Analysis; X Ray Detectors; Radiography; Fuel Sprays

20020076005 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Fishermans Bend, Australia

A Parametric Study of Jet/Vortex Interactions in the AMRL Water Tunnel

Erm, Lincoln P., Defence Science and Technology Organisation, Australia; September 2001; 70p; In English

Contract(s)/Grant(s): DST98/129

Report No.(s): DSTO-TR-1209; DODA-AR-012-017; Copyright; Avail: Issuing Activity

In this report, details are given of a parametric study undertaken in the AMRL flow-visualization water tunnel to determine how vortices are affected when they interact with different types of jet flows. The effects on vortices of jets having different shapes, velocities, locations and pitch angles were investigated. The flow was visualized using dye and vortex behaviour was examined for 42 different jets. It was found that jet shape, jet velocity and jet location all had a significant effect on vortex behaviour, whereas jet pitch angle generally had a minimal effect. Possible physical explanations for vortex behaviour have been proposed. The parametric study is the first stage of a longer investigation aimed at determining the best jet configurations to use to control vertical flow over modern high-performance aircraft to improve aircraft control at extreme flight attitudes. The findings of the initial parametric study will be used in any ongoing work on the investigation.
Author

Flow Visualization; Vortices; Water Tunnel Tests; Parameterization; Jet Flow; F-18 Aircraft

20020076086 Thermacore, Inc., Lancaster, PA USA

Miniature Heat Pipes

Spinoff 1997; 1997, pp. 100; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Small Business Innovation Research contracts from Goddard Space Flight Center to Thermacore Inc. have fostered the company work on devices tagged ”heat pipes” for space application. to control the extreme temperature ranges in space, heat pipes are important to spacecraft. The problem was to maintain an 8-watt central processing unit (CPU) at less than 90 C in a notebook

computer using no power, with very little space available and without using forced convection. Thermacore's answer was in the design of a powder metal wick that transfers CPU heat from a tightly confined spot to an area near available air flow. The heat pipe technology permits a notebook computer to be operated in any position without loss of performance. Miniature heat pipe technology has successfully been applied, such as in Pentium Processor notebook computers. The company expects its heat pipes to accommodate desktop computers as well. Cellular phones, camcorders, and other hand-held electronics are forsible applications for heat pipes.
Author
Heat Pipes; Central Processing Units; User Manuals (Computer Programs); Temperature Control

20020076309 Technische Univ., Faculty of Applied Mathematics, Twente, Netherlands
Fluid Dynamical Systems as Hamiltonian Boundary Control Systems
van der Schaft, A. J.; Maschke, B. M.; Mar. 2001; 22p; In English
Report No.(s): PB2002-105937; MEMO-1575; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
It is shown how the geometric framework for distributed-parameter port-controlled Hamiltonian systems as recently provided can be adapted to formulate ideal adiabatic fluids with non-zero energy flow through the boundary of the spatial domain as Hamiltonian boundary control systems. The key ingredient is the modification of the Stokes-Dirac structure introduced to a Dirac structure defined on the space of mass density 3-forms and velocity 1-forms, incorporating three-dimensional convection. Some initial steps towards stabilization of these boundary control systems, based on the generation of Casimir functions for the closed-loop Hamiltonian system, are discussed.
NTIS
Hamiltonian Functions; Adiabatic Flow; Stokes Law (Fluid Mechanics); Fluid Dynamics; Control Systems Design

20020076411 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. fuer Aerodynamik und Stroemungstechnik, Goettingen, Germany
About the Design and the Application of Adaptive Geometries for Unsteady Flow Control ***Ueber den Entwurf und die Anwendung Adaptiver Geometrien zur Instationaeren Stroemungsbeeinflussung***
Trenker, Markus, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; November 2001; ISSN 1434-8454; 126p; In German
Report No.(s): DLR-FB-2001-25; Copyright; Avail: Issuing Activity
In this work the numerical design of airfoils, using both deformation and question in transonic flow will be examined. Since drag reduction is one of main tasks in the design of aerodynamic components such as aircraft wings and helicopter rotor blades, solutions are sought which fulfill these requirements. Airfoil deformation is used in order to prevent flow separation while adaption of airfoil contours allows operation at off design conditions with reasonable lift to drag ratios. The effectiveness of the models used for an airfoil deformation is investigated in flows in which the onset of dynamic stall is likely to occur. to adapt airfoils to off-design conditions, local shape modifications, which am commonly referred to as bumps, are used. It will be shown that bumps can weaken both the recompression shock as well as the shock-boundary interaction. As can be seen from numerical results, bumps located at the leading edge or in the shock-boundary interaction zone, as well as a combination, result in an improved lift to drag ratio. A design concept, referred to as the "Fictitious Gas Method", is used to generate shock free airfoils for a designpoint in the transonic flow regime. The connection between this design concept and the shaping of bumps is examined. An optimization tool is developed which is used successfully, in combination with other design tools, in generating airfoils for unsteady flows. In order to assess an airfoils' ability to delay or prevent the onset of dynamic stall, the deforming airfoils are subjected to both plunging motion and pitching motion with an superimposed harmonic variation of the freestream Mach number.
Author
Unsteady Flow; Boundary Layer Separation; Airfoils; Transonic Flow; Deformation; Drag Reduction; Free Flow

20020076441 ESDU International Ltd., London, UK
Condensation of pure fluids in downflow on horizontal integral low-fin tube bundles
October 2001; In English; Available from ESDU International as part of the ESDU Series on Heat Transfer.
Report No.(s): ESDU-01009; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only
ESDU 01009 provides a method for predicting the local condensate film coefficient for the downflow of a pure vapor or azeotropic mixture over horizontal integral low-fin tubes and tube bundles, typically in TEMA (Tubular Exchanger Manufacturers' Association) X-shells. The condensation rate on integral low-fin tubes is greater than that on plain tubes of the same nominal outside diameter. Use of low-fin tubing will therefore usually enable the size (tube length and/or bundle diameter) and hence the weight of a condenser for a suitable duty to be reduced compared with the equivalent plain tube unit. Replacement

of plain tubes with integral low-fin tubes of the same overall diameter is often a cost-effective solution when plant up-rating is being considered. They are used to maximum advantage in the condensation of low surface tension fluids such as refrigerants and light hydrocarbons and are commonly specified for refrigeration and air-conditioning plant. Low-fin tubing is increasingly specified for condensers in the process industries generally. A step-by-step calculation method is presented that can, for example, be used to check the adequacy of a design to meet a performance requirement or to estimate the outlet conditions from a given condenser. The calculation method is applicable to those cases where the saturation temperature over the length of the condensing path remains approximately constant. The method covers gravity-controlled flows, flows with high vapor shear and high and low thermal conductivity tube materials. Bundle pressure drops are not calculated; it is assumed that they are negligible in gravity-controlled downflows (as opposed to shear-controlled flows), with the dominant pressure drop occurring across the inlet nozzle. Typical correlation plots show that the available data correlate mostly within 20 per cent for both single tubes and in-line and staggered tube bundles. For a range of condensing fluids, the data cover a wide range of vapour side temperature difference, vapor Reynolds number and fin configurations. The use of the calculation procedure is illustrated by a practical worked example, and the background to the method is presented.
ESDU
Fins; Coefficients; Film Condensation; Pipes (Tubes)

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INSTRUMENTATION AND PHOTOGRAPHY

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

20020074587 Defence Science and Technology Organisation, Victoria, Australia
A Phenomenological Model of Scintillation of Infrared Radiation from Point Targets over Water and Measurements of the Model Parameters
Warren, R. C.; Jan. 2002; 66p; In English
Report No.(s): AD-A404840; DSTO-RR-0231; DODA-AR-012-166; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

As part of a study of the long range detection of antiship missiles (ASMs) by infrared search and track (IRSI) systems using staring sensors, measurements of scintillation of an infrared source have been made. Scintillation of IR radiation from ASMs is one of a few features which may enhance ASM detectability by IRST systems. The measurements were made in the 3-5 micron band at ranges of 17 km and 19.9 km over water. The data were used to provide values for parameters of a phenomenological model of scintillation for use in development of detection algorithms. The parameters were the magnitude of irradiance, blurring effects and image location, and the correlation coefficients of these parameters. It was found that the probability distribution for the irradiance fluctuations was log-Gaussian, as predicted by theory. There was a temporal correlation for each of the parameters which was quantified by a correlation time, but none of the parameters were correlated with any other. Approximate methods were developed for correcting the data for the finite pixel size effects of the camera and the blurring effect of the optics.
DTIC
Antiship Missiles; Infrared Detectors; Correlation Coefficients; Scintillation; Infrared Radiation; Infrared Tracking

20020074600 NASA Ames Research Center, Moffett Field, CA USA
Scaling Properties of Particle Density Fields Formed in Simulated Turbulent Flows
Hogan, Robert C., Symtech Corp., USA; Cuzzi, Jeffrey N., NASA Ames Research Center, USA; Dobrovolskis, Anthony R., California Univ., USA; [1998]; 2p; In English
Contract(s)/Grant(s): RTOP 344-30-51-03; Copyright; Avail: Issuing Activity; Abstract Only

Direct numerical simulations (DNS) of particle concentrations in fully developed 3D turbulence were carried out in order to study the nonuniform structure of the particle density field. Three steady-state turbulent fluid fields with Taylor microscale Reynolds numbers (Re(sub lambda)) of 40, 80 and 140 were generated by solving the Navier-Stokes equations with pseudospectral methods. Large scale forcing was used to drive the turbulence and maintain temporal stationarity. The response of the particles to the fluid was parameterized by the particle Stokes number St, defined as the ratio of the particle's stopping time to the mean period of eddies on the Kolmogorov scale (eta). In this paper, we consider only passive particles optimally coupled to these eddies (St approx. = 1) because of their tendency to concentrate more than particles with lesser or greater St values. The trajectories of up to 70 million particles were tracked in the equilibrated turbulent flows until the particle concentration field

reached a statistically stationary state. The nonuniform structure of the concentration fields was characterized by the multifractal singularity spectrum, f(alpha), derived from measures obtained after binning particles into cells ranging from 2(eta) to 15(eta) in size. We observed strong systematic variations of f(alpha) across this scale range in all three simulations and conclude that the particle concentration field is not statistically self similar across the scale range explored. However, spectra obtained at the 2(eta), 4(eta), and 8(eta) scales of each flow case were found to be qualitatively similar. This result suggests that the local structure of the particle concentration field may be flow-Independent. The singularity spectra found for 2n-sized cells were used to predict concentration distributions in good agreement with those obtained directly from the particle data. This Singularity spectrum has a shape similar to the analogous spectrum derived for the inertial-range energy dissipation fields of experimental turbulent flows at Re(sub lambda) = 110 and 1100. Based on this agreement, and the expectation that both dissipation and particle concentration are controlled by the same cascade process, we hypothesize that singularity spectra similar to the ones found in this work provide a good characterization of the spatially averaged statistical properties of preferentially concentrated particles in higher Re(sub lambda) turbulent flows.
Author
Numerical Analysis; Particle Density (Concentration); Turbulent Flow; Navier-Stokes Equation; Energy Dissipation; Three Dimensional Models

20020074708 NASA Goddard Space Flight Center, Greenbelt, MD USA
An Imaging Laser Altimeter for Lunar Scientific Exploration
The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 55; In English; Also announced as 20020074653; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

A new approach to laser altimetry is offered by the development of micro-lasers and pixilated detectors that enable very high resolution measurement of topography and relatively wide swath observations. An imaging altimeter with a 8x8 array detector working at a probability of less than a single photon/shot could map the Moon or similar sized body in approximately 2 years and provide 5 meter horizontal resolution topography and a 10 centimeter vertical accuracy. In addition, it would provide surface roughness and surface slopes on similar length scales of 5 meters and be able to address a range of problems for which topography or lunar shape is important at the decimeter level. This includes the topography of the polar regions, where ice is thought to have been identified, and also the cratering history of the Moon which could be assessed with a dataset of uniform quality and high resolution.
Author
Laser Altimeters; Lunar Exploration; Lunar Topography

20020074846 NASA Kennedy Space Center, Cocoa Beach, FL USA
Latest Sensors and Data Acquisition Development Efforts at KSC
Perotti, Jose M., NASA Kennedy Space Center, USA; [2002]; 25p; In English; NASA Advanced Sensors Symposium, 30 Jul. 2002, Baltimore, MD, USA
Contract(s)/Grant(s): NAS10-98001
Report No.(s): KSC-2002-096; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This viewgraph presentation summarizes the characteristics required on sensors by consumers desiring access to space, a long term plan developed at KSC (Kennedy Space Center) to identify promising technologies for NASA's own future sensor needs, and the characteristics of several smart sensors already developed. Also addressed are the computer hardware and architecture used to operate sensors, and generic testing capabilities. Consumers desire sensors which are lightweight, inexpensive, intelligent, and easy to use.
CASI
User Requirements; Design Optimization; Spacecraft Instruments; Architecture (Computers)

20020074895 Arizona Univ., Tucson, AZ USA
Wavelet Domain Image Restoration and Super-Resolution
Goda, Matthew E.; Aug. 14, 2002; 150p; In English
Report No.(s): AD-A405111; C102-119; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Multi-resolution techniques, and especially the wavelet transform provide unique benefits in image representation and processing not otherwise possible. While wavelet applications in image compression and denoising have become extremely prevalent, their use in image restoration and super-resolution has not been exploited to the same degree. One issue is the extension

1-D wavelet transforms into 2-D via separable transforms versus the non-separability of typical circular aperture imaging systems. This mismatch leads to performance degradations.
DTIC
Algorithms; High Resolution; Restoration; Imaging Techniques; Wavelet Analysis; Image Resolution

20020074999 Barmby Consulting, Vienna, VA USA
Target Acquisition for Offensive Systems
Barmby, John G.; Jan. 2000; 9p; In English; AIAA 2nd Biennial National Forum on Weapon System Effectiveness, 27-29 Mar. 2002, MD, USA
Report No.(s): AD-A405006; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In order to better evaluate the cost effectiveness of offensive weapon systems, increased attention should be paid to quantifying target acquisition (TA) by the shooters. Recent conflicts such as the Gulf War and Kosovo have illustrated the importance of proper TA. The calculation of the probability of target acquisition is difficult. It should start with an understanding of the five elements in the process, especially, the rules of engagement. Information on target characteristics in a battle setting (signatures) needs to be assessed. Determination must be made as to the contributions (cueing) from support systems not on the attack platform along with the effectiveness of the command, control, communications, intelligence (C3I) net. Next, the on-board equipment, whether pods or integral, and procedures should be investigated based upon test results including pilot proficiency. Then the estimate needs to be degraded for wartime factors such as lighting (day or night), weather (clouds), dust, camouflage, terrain, decoys and stress. The analyst should specify the assumptions, describe the logic, and note the operational environment in order to improve the confidence in the estimates. Equal cost force analyses can be useful for assessing system alternatives and trade-offs among the probabilities.
DTIC
Target Acquisition; Evaluation; Weapon Systems

20020075052 Massachusetts Inst. of Tech., Center for Space Research, Cambridge, MA USA
A Measurement of the Non-Thermal X-Ray Emission of the Supernova Remnant RX J1713.7-3946 ***Final Report***
[2002]; 1p; In English
Contract(s)/Grant(s): NAG5-9235; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The ALP grant was used to support our analysis of the RXTE, ASCA, and ROSAT data for the supernova remnant RX J 1713.7-3946 and to publicize the results of the analysis. This remnant is one of only two whose X-ray emission is dominated by non-thermal emission and that have been detected at Texas energies. Previous X-ray studies failed to find evidence of thermal X-ray emission. For the first time, we have found such evidence for emission from the center of the remnant. The results of our analysis indicate that the average density of the material into which the remnant has expanded is very low. The lack of evidence of thermal emission from the bright northwestern rim of the remnant places an extremely strong constraint on the amount of Texas emission that can be produced by the interaction of very-high energy cosmic-ray protons accelerated in the remnant with other protons in the remnant. This constraint is inconsistent with the published claim that the Texas emission from the rim is due to the decay of neutral plans produced by the collision of Texas protons with material in the remnant. We offer an alternative interpretation of the gamma-ray data which is consistent with all of the available data: the gamma-ray emission is produced by inverse Compton emission from very-high energy electrons. In summary the grant has helped us solve two mysteries about the remnant. The results of this analysis will be published soon in the Astrophysical Journal.
Author
X Rays; Thermal Emission; Supernova Remnants; Proton Energy; High Energy Electrons

20020075577 NASA Marshall Space Flight Center, Huntsville, AL USA
Inducer Hydrodynamic Load Measurement Devices
Skelley, Stephen E., NASA Marshall Space Flight Center, USA; Zoladz, Thomas F., NASA Marshall Space Flight Center, USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 353-362; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Marshall Space Flight Center (MSFC) has demonstrated two measurement devices for sensing and resolving the hydrodynamic loads on fluid machinery. The first - a derivative of the six component wind tunnel balance - senses the forces and moments on the rotating device through a weakened shaft section instrumented with a series of strain gauges. This ”rotating balance” was designed to directly measure the steady and unsteady hydrodynamic loads on an inducer, thereby defining both the amplitude and frequency content associated with operating in various cavitation modes. The second device - a high frequency response pressure transducer surface mounted on a rotating component - was merely an extension of existing technology for

application in water. MSFC has recently completed experimental evaluations of both the rotating balance and surface-mount transducers in a water test loop. The measurement bandwidth of the rotating balance was severely limited by the relative flexibility of the device itself, resulting in an unexpectedly low structural bending mode and invalidating the higher frequency response data. Despite these limitations, measurements confirmed that the integrated loads on the four-bladed inducer respond to both cavitation intensity and cavitation phenomena. Likewise, the surface-mount pressure transducers were subjected to a range of temperatures and flow conditions in a non-rotating environment to record bias shifts and transfer functions between the transducers and a reference device. The pressure transducer static performance was within manufacturer's specifications and dynamic response accurately followed that of the reference.
Author
Cavitation Flow; Turbomachinery; Hydrodynamics; Loads (Forces); Pressure Sensors; Experiment Design

20020076106 Bechtel Nevada Corp., Las Vegas, NV USA
Development and Performance of Bechtel Nevada's Nine-Frame Camera System
Baker, S. A.; Griffith, M. J.; Tybo, J. L.; Jul. 01, 2002; 10p; In English
Report No.(s): DE2001-797468; DOE/NV/11718--695; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Bechtel Nevada, Los Alamos Operations, has developed a high-speed, nine-frame camera system that records a sequence from a changing or dynamic scene. The system incorporates an electrostatic image tube with custom gating and deflection electrodes. The framing tube is shuttered with high-speed gating electronics, yielding frame rates of up to 5MHz. Dynamic scenes are lens-coupled to the camera, which contains a single photocathode gated on and off to control each exposure time. Deflection plates and drive electronics move the frames to different locations on the framing tube output. A single charge-coupled device (CCD) camera then records the phosphor image of all nine frames. This paper discusses setup techniques to optimize system performance. It examines two alternate philosophies for system configuration and respective performance results. We also present performance metrics for system evaluation, experimental results, and applications to four-frame cameras.
NTIS
CCD Cameras; High Speed Photography; Optimization; Systems Engineering

20020076143 Interactive Pictures Corp., Knoxville, TN USA
Spherical Camera
Spinoff 1997; 1997, pp. 76; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Developed largely through a Small Business Innovation Research contract through Langley Research Center, Interactive Picture Corporation's IPIX technology provides spherical photography, a panoramic 360-degrees. NASA found the technology appropriate for use in guiding space robots, in the space shuttle and space station programs, as well as research in cryogenic wind tunnels and for remote docking of spacecraft. Images of any location are captured in their entirety in a 360-degree immersive digital representation. The viewer can navigate to any desired direction within the image. Several car manufacturers already use IPIX to give viewers a look at their latest line-up of automobiles. Another application is for non-invasive surgeries. by using OmniScope, surgeons can look more closely at various parts of an organ with medical viewing instruments now in use. Potential applications of IPIX technology include viewing of homes for sale, hotel accommodations, museum sites, news events, and sports stadiums.
Author
Bioinstrumentation; Cameras; Images; Photography; Position (Location)

20020076145 General Pneumatics Corp., Western Research Center, Phoenix, AZ USA
Portable Radiation Detectors
Spinoff 1997; 1997, pp. 71; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Through a Small Business Innovation Research (SBIR) contract from Kennedy Space Center, General Pneumatics Corporation's Western Research Center satisfied a NASA need for a non-clogging Joule-Thomson cryostat to provide very low temperature cooling for various sensors. This NASA-supported cryostat development played a key part in the development of more portable high-purity geranium gamma-ray detectors. Such are necessary to discern between the radionuclides in medical, fuel, weapon, and waste materials. The outcome of the SBIR project is a cryostat that can cool gamma-ray detectors, without

vibration, using compressed gas that can be stored compactly and indefinitely in a standby mode. General Pneumatics also produces custom J-T cryostats for other government, commercial and medical applications.
Author
Commerce; Cooling; Cryostats; Gamma Ray Spectrometers; Radiation Detectors

20020076146 Amber Engineering Co., Goleta, CA USA
Infrared Camera
Spinoff 1997; 1997, pp. 68-69; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

A sensitive infrared camera that observes the blazing plumes from the Space Shuttle or expendable rocket lift-offs is capable of scanning for fires, monitoring the environment and providing medical imaging. The hand-held camera uses highly sensitive arrays in infrared photodetectors known as quantum well infrared photo detectors (QWIPS). QWIPS were developed by the Jet Propulsion Laboratory's Center for Space Microelectronics Technology in partnership with Amber, a Raytheon company. In October 1996, QWIP detectors pointed out hot spots of the destructive fires speeding through Malibu, California. Night vision, early warning systems, navigation, flight control systems, weather monitoring, security and surveillance are among the duties for which the camera is suited. Medical applications are also expected.
Author
Aerospace Engineering; Cameras; Early Warning Systems; Fires; Flight Control; Infrared Detectors; Plumes

20020076147 CTA Space Systems, McLean, VA USA
Reaction/Momentum Wheel
Spinoff 1997; 1997, pp. 56; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

CTA Space Systems, Inc. has been licensed to sell commercially a reaction/momentum wheel originally developed for NASA's scientific satellites. NASA originally identified a need for the wheel in its Small Explorer program. The Submillimeter Wave Astronomy Satellite required extremely low jitter and a reaction/momentum wheel with a torque greater than any comparably sized commercially available wheel to keep the instrument pointed at celestial objects to a high degree of precision. After development, a market assessment by Research Triangle Institute was completed, showing commercial potential for the flywheel technology. A license was granted to CTA in the fall of 1996. The company currently uses the technology in its complete spacecraft fabrication services and has built over 10 reaction/momentum wheels for commercial, scientific, and military customers.
Author
Celestial Bodies; Fabrication; Flywheels; Reaction Wheels; Submillimeter Wave Astronomy Satellite

20020076159 Wedeven Associates, Inc., Edgemont, PA USA
Smart Test Machines
Spinoff 1997; 1997, pp. 97; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Vern Wedeven, president of Wedeven Associates, developed the WAM4, a computer-aided "smart" test machine for simulating stress on equipment, based on his bearing lubrication expertise gained while working for Lewis Research Center. During his NASA years from the 1970s into the early 1980s, Wedeven initiated an "Interdisciplinary Collaboration in Tribology," an effort that involved NASA, six universities, and several university professors. The NASA-sponsored work provided foundation for Wedeven in 1983 to form his own company. Several versions of the smart test machine, the WAM1, WAM2, and WAM3, have proceeded the current version, WAM4. This computer-controlled device can provide detailed glimpses at gear and bearing points of contact. WAM4 can yield a three-dimensional view of machinery as an operator adds "what-if" thermal and lubrication conditions, contact stress, and surface motion. Along with NASA, a number of firms, including Pratt & Whitney, Caterpillar Tractor, Exxon, and Chevron have approached Wedeven for help on resolving lubrication problems.
Author
Lubrication; Tribology; Contact Resistance; Computer Techniques

20020076217 FFPI Industries, Inc., Bryan, TX USA
Pressure Measurement Sensor
Spinoff 1997; 1997, pp. 112; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

FFPI Industries Inc. is the manufacturer of fiber-optic sensors that furnish accurate pressure measurements in internal combustion chambers. Such an assessment can help reduce pollution emitted by these engines. A chief component in the sensor owes its seven year- long development to Lewis Research Center funding to embed optical fibers and sensors in metal parts. NASA support to Texas A&M University played a critical role in developing this fiber optic technology and led to the formation of FFPI Industries and the production of fiber sensor products. The simple, rugged design of the sensor offers the potential for mass production at low cost. Widespread application of the new technology is forseen, from natural gas transmission, oil refining and electrical power generation to rail transport and the petrochemical paper product industry.
Author
Pressure Measurement; Sensors; Fiber Optics; Manufacturing; Combustion Chambers

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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.

20020074084 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Ultrafast Modulation and Switching of Quantum-Well Lasers using Terahertz Fields
Ning, Cun-Zheng, MRJ Technology Solutions, Inc., USA; Hughes, S., Washington State Univ., USA; Citrin, D., Washington State Univ., USA; [1998]; 1p; In English; Photonics West, 23-29 Jan. 1999, San Jose, CA, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

Modulation and switching of semiconductor lasers are important for laser-based information technology. Typically the speed of modulation and switching is limited by interband processes such as stimulated and spontaneous recombinations which occur on a nanosecond time scale. This is why the diode laser modulation has been restricted to tens of GHz. Modulation at higher speed is highly desirable as the information technology enters into the so-called tera-era. In this paper, we study the possibility of utilizing THz-field-induced plasma heating to modulate quantum-well lasers. This is a timely study since, with the advancement of THz solid-state sources and free-electron lasers, THz physics and related technology is currently coming out of its infancy. The investigation of interplaying THz and optical fields is also of intruiging fundamental interest. First, we introduce theoretical plasma heating results for the quantum-well optical amplifier in the presense of an intense half-cycle THz pulse. The heated carrier distributions are then utilized to calculate the THz-pulse-induced change in refractive index and gain profile. Since the electron-hole-plasma is heated using intraband transitions, we circumvent the usual complications due to an overall change in density, and the nonlinear recovery is governed solely by the carrier-LO-phonon interactions, typically 5 ps for a complete recovery. This procedure implies THz and sub-THz switching and recovery rates, respectively; using either gain modulation or index modulation. Plasma heating via steady-state THz fields is also studied. Finally, numerical simulation of a coupled set of equations to investigate the THz modulation based on a simplified model for quantum-well lasers is presented. Our results show that a semiconductor laser can be modulated at up to 1 THz with little distortion with a THz field amplitude at the order of a few kV/cm. Laser responses to a change in THz frequency will be shown. Constraints, practicalities, and applications will be discussed.
Author
Light Modulation; Semiconductor Lasers; Plasma Heating; Quantum Well Lasers

20020074606 NASA Ames Research Center, Moffett Field, CA USA
Transverse Mode Dynamics of VCSELs Through Space-Time Domain Simulation
Goorjian, Peter M., NASA Ames Research Center, USA; Ning, Cun-Zheng, MRJ Technology Solutions, Inc., USA; [1999]; 1p; In English; Photonics West 1999 SPIE, 23-29 Jan. 1999, San Jose, CA, USA; Sponsored by International Society for Optical Engineering, USA
Contract(s)/Grant(s): RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

Modeling and simulation are important to understand laser operation and to optimize and design device functions. Numerical simulation of VCSEL (Vertical Cavity Surface Emitting Lasers) has been largely based on solving time-independent Helmholtz equation or time dependent coupled mode equations. There are various advantages for choosing these approaches. However, the disadvantages are also apparent. The former cannot handle dynamical mode competition seen in VCSELs, while the latter assumes a given type and number of modes a priori. Furthermore, the microscopic physics of heterstructures and electron-hole plasma is very often represented by a few parameters such as linear gain coefficients and the linewidth enhancement factor. These are over

simplification of space and frequency (wavelength) dependent gain and refractive index functions. When the space-time dynamical operation of VCSELs becomes important, these simple approximations become questionable. In this paper, we apply a recently developed model for edge-emitting lasers to a gain guided VCSEL for space-time domain simulation. This model takes into account the actual nonlinear dependence of gain and refractive index on frequency and carrier density within the frame work of the effective Bloch equations. The corresponding partial differential equations are solved directly by finite difference methods. Laser behavior with increasing pumping current is investigated in detail. Special attention is paid to the dynamical competition of the transverse modes.
Author
Surface Emitting Lasers; Partial Differential Equations; Finite Difference Theory; Simulation; Laser Modes

20020074652 Communications Research Lab., Japan
Research and Developments on p-Type Germanium Lasers in the Frequency Range from 0.1 Terahertz to few Terahertz
Hosako, Iwao, Communications Research Lab., Japan; Hiromoto, Norihisa, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 81-94; In Japanese; Copyright; Avail: Issuing Activity

The recent developments on the p-type Germanium hot-hole laser oscillating in the frequency range from 0.1 terahertz to few terahertz are described in this report. The present stage of development is very close to the practical use as a tunable solid-state coherent sources in millimeter waves and terahertz waves.
Author
Fabrication; P-Type Semiconductors; Germanium; Lasers; Millimeter Waves

20020076094 Microcosm, Inc., Columbia, MD USA
Super-Compact Laser
Spinoff 1997; 1997, pp. 114-115; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Microcosm, Inc. produced the portable Farfield-2 laser for field applications that require high power pulsed illumination. The compact design was conceived through research at Goddard Space Flight Center on laser instruments for space missions to carry out geoscience studies of Earth. An exclusive license to the key NASA patent for the compact laser design was assigned to Microcosm. The FarField-2 is ideal for field applications, has low power consumption, does not need water cooling or gas supplies, and produces nearly ideal beam quality. The properties of the laser also make it effective over long distances, which is one reason why NASA developed the technology for laser altimeters that can be toted aboard spacecraft. Applications for the FarField-2 include medicine, biology, and materials science and processing, as well as diamond marking, semiconductor line-cutting, chromosome surgery, and fluorescence microscopy.
Author
Miniaturization; Solid State Lasers; Ultraviolet Detectors; Diamonds; Microscopy; Semiconductors (Materials); Laser Altimeters

20020076125 Opotek, Inc., Carlsbad, CA USA
Contaminant Monitor Laser
Spinoff 1997; 1997, pp. 89; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under a Small Business Innovation Research contract from Langley Research Center, OPOTEK, Inc. developed a laser transmitter for remote sensing of water vapor in the upper atmosphere. As a leader in developing and using Differential Absorption Lidar, a remote sensing technique to monitor ozone and water vapor in the atmosphere, NASA was interested in upgrading the capabilities of its airborn laser systems. The laser transmitter developed for NASA was used for measuring water vapor in the infrared region. by broadening this concept to other wavelengths, OPOTEK believes a range of industrial applications can be met. In addition, the tunable laser system can be used by the Drug Enforcement Administration to discern the by-products from illegal drug manufacturing. A host of other government, university, and industrial laboratory uses for the technology are also being examined as follow-up by the company.
Author
Transmitters; Lasers; Fabrication; Water Vapor; Remote Sensing

20020076255 Naval Research Lab., Space Science Div., Washington, DC USA
Study of 2D laser beam imprinting using an asymmetric channel cut crystal
Seely, J.; Brown, C.; Holland, G.; May 03, 1999; 6p; In English
Report No.(s): DE2001-762783; CERN/LHCC/98-36; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The contents of this report cover the following three topics: (1) design of the asymmetric channel cut crystal; (2) fabrication of the silicon crystal; and (3) experimental x-ray data.
NTIS
Asymmetry; Crystals; Laser Beams; Fabrication; Two Dimensional Models

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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.

20020075673 Argonne National Lab., IL USA
Effect of thin-film coating on wear in EGR-contaminated oil
Ajayi, O. O.; Aldajah, S. H.; Erdemir, A.; Fenske, G. R.; Dec. 06, 2001; 14p; In English
Report No.(s): DE2001-795816; ANL/ET/CP-105673; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Increased use of higher-efficiency compression ignition direct injection (CIDI) diesel engines instead of today's gasoline engines will result in reduced fuel consumption and greenhouse gases emissions. However, NO(sub x) and particulate exhaust emissions from diesel engines must be significantly reduced due to their possible adverse health effects. Exhaust gas recirculation (EGR) is an effective way to reduce NO(sub x) emissions from diesel engines, but the particulates and acidic exhaust products in the recirculated gas will contaminate engine lubricant oil by increasing the soot content and total acid number (TAN). These factors will increase the wear rate in many critical engine components and seriously compromise engine durability. We have investigated the use of commercially available thin and hard coatings (TiN, TiCN, TiAlN, and CrN) to mitigate the negative effects of EGR on wear. In tests with the four-ball machine according to ASTM D4172, we found that all the four coatings deposited on M-50 steel significantly reduced wear in EGR-contaminated oils when compared with uncoated M50 steel balls.
NTIS
Coatings; Diesel Engines; Lubricants; Thin Films; Contamination; Oils

20020076153 Ultrafast, Inc., Malvern, PA USA
Intelligent Fasteners
Spinoff 1997; 1997, pp. 63; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under a Small Business Innovation Research contract from Marshall Space Flight Center, Ultrafast, Inc. developed the world's first, high-temperature resistant, "intelligent" fastener. NASA needed a critical-fastening appraisal and validation of spacecraft segments that are coupled together in space. The intelligent-bolt technology deletes the self-defeating procedure of having to untighten the fastener, and thus upset the joint, during inspection and maintenance. The Ultrafast solution yielded an innovation that is likely to revolutionize manufacturing assembly, particularly the automobile industry. Other areas of application range from aircraft, computers and fork-lifts to offshore platforms, buildings, and bridges.
Author
Resistance Heating; Fasteners; Fabrication; Commerce

20020076369 Automotive Testing Labs., Inc., East Liberty, OH USA
Interlaboratory Crosscheck of Heavy-Duty Vehicle Chassis Dynamometers ***Final Report***
Traver, M. L.; May 2002; 1p; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-107303; No Copyright; Avail: CASI; A01, Microfiche; A01, Hardcopy

Six laboratories capable of testing a heavy-duty vehicle were asked to perform a series of transient and steady state tests for comparative purposes. The vehicle, a Ford L-9000 single axle tractor, was selected as typical of the heavy-duty fleet on American

highways while presenting minimum difficulty for the participating laboratories. Emissions data from each lab were compiled and presented in graphical format with statistical analyses performed to gauge the repeatability and reproducibility of each lab's data. Results from the crosscheck were mixed with some measured emissions staying consistent levels throughout and some varying significantly.
NTIS
Automobiles; Dynamometers; Chassis; Emission Spectra; Test Stands; Laboratories

20020076408 ESDU International Ltd., London, UK
Thermal conductivity, viscosity, isobaric specific heat capacity and Prandtl number of gases at low pressure: halogenated hydrocarbons - halomethanes
February 2002; In English; Available from ESDU International as part of the ESDU Series on Physical Data, Chemical Engineering and on Physical Data, Mechanical Engineering.
Report No.(s): ESDU-02003; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only
ESDU 02003 presents values of thermal conductivity, dynamic viscosity, specific heat capacity and Prandtl number of the vapors of 26 halogenated methanes in the dilute or ideal gas. The data for thermal conductivity and viscosity result from the correlation of experimental data extracted from the literature. For specific heat capacity, the data were calculated from best fits to values published by the Thermodynamics Research Center. The data correlation procedures used to obtain the values of thermal conductivity, viscosity and specific heat capacity are described and the effects of pressure are indicated. The experimental data used are believed to be the most reliable available and have been reviewed and suitably extended. The data are presented in tabular form at intervals of either 20 K or 20 degree Celsius and as equations (except for the Prandtl number). The temperature range covered is from below the normal boiling point to at least 600 K. The likely uncertainties in the values are noted on the text, and the sources of the data for each compound are listed.
ESDU
Methane; Prandtl Number; Pressure Effects; Specific Heat; Thermal Conductivity; Viscosity; Halocarbons

20020076459 ESDU International Ltd., London, UK
Thermal conductivity, viscosity, isobaric specific heat capacity and Prandtl number of gases at low pressure: halogenated hydrocarbons - haloethanes
May 2002; In English; Available from ESDU International as part of the ESDU Series on Physical Data, Chemical Engineering and on Physical Data, Mechanical Engineering.
Report No.(s): ESDU-02004; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only
ESDU 02004 presents values of thermal conductivity, dynamic viscosity, specific heat capacity and Prandtl number of the vapors of 36 halogenated ethanes in the dilute or ideal gas. The data for thermal conductivity and viscosity result from the correlation of experimental data extracted from the literature. For specific heat capacity, the data in general were calculated from best fits to values published by the Thermodynamics Research Center. The data correlation procedures used to obtain the values of thermal conductivity, viscosity and specific heat capacity are described and the effects of pressure are indicated. The experimental data used are believed to be the most reliable available and have been reviewed and suitably extended. The data are presented in tabular form at intervals of either 20 K or 20 degree Celsius and as equations (except for the Prandtl number). The temperature range covered is from below the normal boiling point to at least 600 K. The likely uncertainties in the values are noted on the text, and the sources of the data for each compound are listed.
ESDU
Prandtl Number; Pressure Effects; Specific Heat; Thermal Conductivity; Viscosity; Halocarbons; Ethane

20020076470 ESDU International Ltd., London, UK
Guide to the use of ESDU Items on cam design
June 2001; In English; Available from ESDU International as part of the ESDU Series on Mechanisms.
Report No.(s): ESDU-01002; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only
ESDU (Engineering Sciences Data Unit) 01002 will assist users of the wide range of ESDU documents on the design of cam mechanisms to employ them to best advantage. It provides a brief outline of cam design, identifying the major stages of the process which involve: specification of the technical objectives, selection of the mechanism type to meet those objectives, evaluation of the primary component dimensions to achieve the required follower motion, performance analysis of the final design, and assessment of the final results. At each stage of this design and analysis process those ESDU documents of relevance are

referenced. Also included is a list of common causes of failure of cam and follower mechanisms together with their symptoms and a set of remedies.
ESDU
Design Analysis; Cams; Mechanical Engineering; Product Development

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QUALITY ASSURANCE AND RELIABILITY

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

20020076110 Silicon Mountain Design, Inc., Colorado Springs, CO USA
Industrial X-Ray Imaging
Spinoff 1997; 1997, pp. 118; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

In 1990, Lewis Research Center jointly sponsored a conference with the U.S. Air Force Wright Laboratory focused on high speed imaging. This conference, and early funding by Lewis Research Center, helped to spur work by Silicon Mountain Design, Inc. to break the performance barriers of imaging speed, resolution, and sensitivity through innovative technology. Later, under a Small Business Innovation Research contract with the Jet Propulsion Laboratory, the company designed a real-time image enhancing camera that yields superb, high quality images in 1/30th of a second while limiting distortion. The result is a rapidly available, enhanced image showing significantly greater detail compared to image processing executed on digital computers. Current applications include radiographic and pathology-based medicine, industrial imaging, x-ray inspection devices, and automated semiconductor inspection equipment.
Author
X Ray Imagery; Sensitivity; Image Processing; Imaging Techniques; Real Time Operation; High Speed

20020076207 Liberty Technology, Conshohocken, PA USA
Filmless Radiography
Spinoff 1997; 1997, pp. 113; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Technology initially prototyped under a Small Business Innovation Research contract between Quantex Corporation and Langley Research Center was licensed to Liberty Technology and incorporated into RADView, a new filmless radiography technology. The NASA-sponsored work involved the investigation of Electron Trapping, which led to a solid-state film that uses a special class of photoluminescent materials to capture radiographic images. RadView is a total imaging solution for the conversion of radiographic film records to digital format and digital acquisitions of radiographs. With the RADView technology, there is a reduction of exposure times and errors; film waste is eliminated; and the efficiency of data management and precise image analysis is boosted. The solid-state film can be exposed, read, erased, and re- exposed indefinitely until mechanical replacement is required. Digital images can be stored to optical media for up to 100 years and beyond without information loss.
Author
Radiography; Technology Assessment; Imaging Techniques; Image Analysis; Trapping; Electrons; Photographic Film

20020076260 Naval Research Lab., Center for Computational Materials Science, Washington, DC USA
Concurrent Coupling of Length Scales
Bernstein, Noam, Naval Research Lab., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 41-64; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This work on concurrent coupling of length scales begins with an overview of the coupling of length scales (CLS) concept. In particular, I discuss the differences between 'sequential' and 'concurrent' coupling of length scales approaches. After a brief introduction to the relevant issues in fracture, I describe our first approach to the CLS method. I describe the method we developed, and some results and lessons we learned from that work. I then describe our current CLS approach for simulating fracture. After presenting the method and results, I present some future directions and conclusions.
Derived from text
Length; Scale (Ratio); Computerized Simulation

20020076293 Honeywell Federal Mfg. and Technologies, Kansas City, MO USA
Performance Enhancement of the Automated Concrete Evaluation System (ACES) ***Final Report***
Baumgart, C. W.; Cave, S. P.; Linder, K. E.; Feb. 2002; 16p; In English
Report No.(s): DE2002-791601; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this proposed research is to improve and expand the detection and analysis capabilities of the automated, concrete evaluation (ACE) system. MoDOT and Honeywell jointly developed this system. The focus of this proposed research will be on the following: Coordination of concrete imaging efforts with other states, Validation and testing of the ACE system on a broad range of concrete samples, and Identification and development of software and hardware enhancements. These enhancements will meet the needs of diverse users in the field of concrete materials, construction, and research.
NTIS
Concretes; Coordination; Imaging Techniques; Computer Programs

20020076375 Idaho National Engineering and Environmental Lab., Idaho Falls, ID USA
Laser Acoustic Microstructure Analysis at the Micron and Nanometer Length Scale
Telschow, K. L.; Hurley, D. H.; May 15, 2002; 9p; In English
Report No.(s): DE2001-797772; INEEL/CON-02-00682; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Laser acoustic approaches to investigating the interaction of elastic waves with microstructure in materials is presented that probe both the micron and nanometer length scales. At the micron length scale, a full-field imaging approach is described that provides quantitative measurement of amplitude and phase of the out-of-plane acoustical motion at GHz frequencies. Specific lateral acoustic modes can be identified in addition to the primary thickness mode with spatial resolution sufficient to image wavelengths as small as 4.5 microns.
NTIS
Acoustics; Microstructure; Acoustic Measurement; Acoustic Properties; Imaging Techniques

20020077948 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
Reliability of Fault Tolerant Control Systems, Part 2
Wu, N. Eva, Binghamton Univ., USA; [2000]; 6p; In English
Contract(s)/Grant(s): NCC1-336; NSF ECS-96-15956; HE-1321-98; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper reports Part II of a two part effort that is intended to delineate the relationship between reliability and fault tolerant control in a quantitative manner. Reliability properties peculiar to fault-tolerant control systems are emphasized, such as the presence of analytic redundancy in high proportion, the dependence of failures on control performance, and high risks associated with decisions in redundancy management due to multiple sources of uncertainties and sometimes large processing requirements. As a consequence, coverage of failures through redundancy management can be severely limited. The paper proposes to formulate the fault tolerant control problem as an optimization problem that maximizes coverage of failures through redundancy management. Coverage modeling is attempted in a way that captures its dependence on the control performance and on the diagnostic resolution. Under the proposed redundancy management policy, it is shown that an enhanced overall system reliability can be achieved with a control law of a superior robustness, with an estimator of a higher resolution, and with a control performance requirement of a lesser stringency.
Author
Control Theory; Fault Tolerance; Reliability Engineering; Control Systems Design; Optimization

20020077955 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
Optimal Management of Redundant Control Authority for Fault Tolerance
Wu, N. Eva, Binghamton Univ., USA; Ju, Jianhong, Binghamton Univ., USA; [2000]; 2p; In English
Contract(s)/Grant(s): HE-1321-98; NCC1-336; NSF ECS-96-15956; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper is intended to demonstrate the feasibility of a solution to a fault tolerant control problem. It explains, through a numerical example, the design and the operation of a novel scheme for fault tolerant control. The fundamental principle of the scheme was formalized in [5] based on the notion of normalized nonspecificity. The novelty lies with the use of a reliability criterion for redundancy management, and therefore leads to a high overall system reliability.
Author
Fault Tolerance; Redundancy; Mathematical Models; Linearity; Optimal Control

20020077960 Binghamton Univ., Center for Intelligent Systems, Binghamton, NY USA
Optimal Redundancy Management in Reconfigurable Control Systems Based on Normalized Nonspecificity
Wu, N.Eva, Binghamton Univ., USA; Klir, George J., Binghamton Univ., USA; [1998]; 12p; In English
Contract(s)/Grant(s): NCC1-336; NSF ECS-96-15956; HE-1321-98; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper the notion of normalized nonspecificity is introduced. The nonspecifity measures the uncertainty of the estimated parameters that reflect impairment in a controlled system. Based on this notion, a quantity called a reconfiguration coverage is calculated. It represents the likelihood of success of a control reconfiguration action. This coverage links the overall system reliability to the achievable and required control, as well as diagnostic performance. The coverage, when calculated on-line, is used for managing the redundancy in the system.
Author
On-Line Systems; Redundancy; Control Systems Design; Control Theory; Reconfigurable Hardware; Optimization

20020077963 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
Parametric Modeling and Fault Tolerant Control
Wu, N. Eva, Binghamton Univ., USA; Ju, Jianhong, Binghamton Univ., USA; [2000]; 8p; In English; Original contains color illustrations
Contract(s)/Grant(s): NCC1-336; NSF ECS-96-15956; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Fault tolerant control is considered for a nonlinear aircraft model expressed as a linear parameter-varying system. by proper parameterization of foreseeable faults, the linear parameter-varying system can include fault effects as additional varying parameters. A recently developed technique in fault effect parameter estimation allows us to assume that estimates of the fault effect parameters are available on-line. Reconfigurability is calculated for this model with respect to the loss of control effectiveness to assess the potentiality of the model to tolerate such losses prior to control design. The control design is carried out by applying a polytopic method to the aircraft model. An error bound on fault effect parameter estimation is provided, within which the Lyapunov stability of the closed-loop system is robust. Our simulation results show that as long as the fault parameter estimates are sufficiently accurate, the polytopic controller can provide satisfactory fault-tolerance.
Author
Fault Tolerance; Nonlinearity; Parameterization; Control Systems Design; Mathematical Models; Robustness (Mathematics)

20020077965 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA
Reliability of Fault Tolerant Control Systems, Part 1
Wu, N. Eva, Binghamton Univ., USA; [2001]; 6p; In English
Contract(s)/Grant(s): NCC1-336; NSF ECS-96-15956; HE-1321-98; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper reports Part I of a two part effort, that is intended to delineate the relationship between reliability and fault tolerant control in a quantitative manner. Reliability analysis of fault-tolerant control systems is performed using Markov models. Reliability properties, peculiar to fault-tolerant control systems are emphasized. As a consequence, coverage of failures through redundancy management can be severely limited. It is shown that in the early life of a syi1ein composed of highly reliable subsystems, the reliability of the overall system is affine with respect to coverage, and inadequate coverage induces dominant single point failures. The utility of some existing software tools for assessing the reliability of fault tolerant control systems is also discussed. Coverage modeling is attempted in Part II in a way that captures its dependence on the control performance and on the diagnostic resolution.
Author
Fault Tolerance; Reliability Engineering; Control Systems Design; Reliability Analysis

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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.

20020074988 Raton Technology Research, Inc., Raton, NM USA
Detection and Imaging of Underground Structures by Exploiting ELF/VLF radiowaves ***Final Report, 5 Mar. 1998-30 Oct. 1999***
Stolarczyk, Larry G.; Jan. 14, 2000; 66p; In English
Contract(s)/Grant(s): F19628-98-C-0012; Proj-4268
Report No.(s): AD-A404941; RTR-2000-01; AFRL-VS-TR-2000-1583; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Clandestine tunnels and underground complexes have been developed in recent years to conceal border crossing passageways and military assets. Ground or airborne attack requires overt and covert imaging to determine the orientation of the underground facility, classification of the overlying rock/soil, burial depth, location of adits, and power and communication lines. Standard worldwide mining practice causes electrical conductors to be installed in the adit and passageways of the underground complex. These electrical conductors form low attenuation rate networks for distribution of EM waves throughout the complex. The electric field component of the primary (illuminating) EM wave induces current flow in these conductors. The current flow causes cylindrically spreading secondary waves to propagate in the surrounding rock mass and become observable on the surface. Mapping the observable provides the information needed for detection. Both analytical codes to determine the underground complex response and highly effective instrumentation for measuring secondary waves have been developed. The High Frequency Active Auroral Research Project transmitter produces and EM wave magnetic field component that is measurable on the earth's surface, making it an effective standoff transmitter for evaluating detection technologies.
DTIC
Radio Waves; Underground Structures; Gradiometers

20020074998 Army Engineer Research and Development Center, Information Technology Lab., Vicksburg, MS USA
State of the Practice in the Design of Tall, Stiff, and Flexible Tieback Retaining Walls ***Final Report***
Strom, Ralph W.; Ebeling, Robert M.; Dec. 2001; 253p; In English
Report No.(s): AD-A405009; ERDC/ITL-TR-01-1; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

In tieback wall design, the determination of anchor loads and wall forces requires knowledge about the interaction between the wall and the soil during successive stages of excavation, as well as after completion of the project. Interaction between the wall and soil is difficult to predict. As a result, simple methods of analysis have been developed for use in the design of various tieback wall systems. These methods may, or may not, require a construction sequencing analysis. This report describes state-of-the-practice analytical methods used to evaluate tieback wall performance and to design the tieback wall and ground anchor system. Analytical methods include equivalent beam on rigid support methods, beam on elastic foundation methods, and finite element methods. The applicability of the various design methods with respect include vertical sheet-pile systems, solider beam systems with wood or concrete lagging, secant cylinder pile systems, reinforced concrete slurry wall systems, and slurry wall systems constructed using soldier beams and concrete lagging. Analysis methods depend on whether the tieback wall system is stiff or flexible. The report describes the characteristics of stiff and flexible tieback wall systems and indicates how the analysis method selected can be influenced by wall stiffness.
DTIC
Walls; Evaluation

20020075027 California Univ., San Diego, Dept. of Applied Mechanics and Engineering Sciences, La Jolla, CA USA
New Approach to Structural Reliability in Fatigue Failure ***Final Report***
Nemat-Nasser, Sia; Zarka, Joseph; Aug. 15, 2002; 19p; In English; Original contains color images
Contract(s)/Grant(s): N00014-96-1-0631
Report No.(s): AD-A405048; 97PR01513-00; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The project objective is to develop formalism for assessing fatigue fracture of welded parts of ship structures based on a newly developed automatic Learning Expert System (L.E.S.), using extensive knowledge of material characteristics, experimental results, and results obtained through computational simulations. Any study of the welds on a ship structure must take into account the uncertainties and random characteristics of the loading, as well as the fatigue lifetime of the welds. Due to the stochastic nature

of the loads, the available deterministic approaches are not sufficient to give a reliable evaluation of the structural safety. Although there has been some effort to fill this gap by probabilistic approaches, these are yet of limited usefulness because of the limited available databases. The research project will ultimately demonstrate the applicability and effectiveness of L.E.S to this class of engineering mechanics problems. As the first and fundamental step in this project, it is necessary to build a relevant database. Experimental and field date has secured from Navy research centers, and through collaboration with scientists working in this general area. Additional data has been obtained from literature searches.
DTIC
Welded Joints; Ships; Welded Structures; Structural Members; Expert Systems; Fatigue (Materials)

20020076099 Collier Research and Development Corp., Hampton, VA USA
Structural Analysis and Design Software
Spinoff 1997; 1997, pp. 96; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Collier Research and Development Corporation received a one-of-a-kind computer code for designing exotic hypersonic aircraft called ST-SIZE in the first ever Langley Research Center software copyright license agreement. Collier transformed the NASA computer code into a commercial software package called HyperSizer, which integrates with other Finite Element Modeling and Finite Analysis private-sector structural analysis program. ST-SIZE was chiefly conceived as a means to improve and speed the structural design of a future aerospace plane for Langley Hypersonic Vehicles Office. Including the NASA computer code into HyperSizer has enabled the company to also apply the software to applications other than aerospace, including improved design and construction for offices, marine structures, cargo containers, commercial and military aircraft, rail cars, and a host of everyday consumer products.
Author
Applications Programs (Computers); Composite Materials; Thermal Stresses; Structural Analysis; Structural Design

20020076274 Princeton Univ., Princeton Materials Inst., NJ USA
On The Role of Plasticity Length Scale Parameters in Multi-Scale Modeling
Soboyejo, W. O., Princeton Univ., USA; Lou, J., Princeton Univ., USA; Shrotriya, P., Princeton Univ., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 397-442; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The emerging applications of MEMS (micro-electro-mechanical systems) structures include: micro-motors; micro-satellites; micro-switches; accelerometers; actuators and sensors. The existing $ 2 billion market for MEMS structures is expected to grow to approx. $ 5 billion within a year. Photographs of emerging MEMS products are presented. These include an accelerometers and a turbine rotor controlled by a fiber optic cable. The presentation covers the following areas: Introduction and background; Micro-tensile experiments; Micro-bending experiments; Nano-indentation experiments; Framework for multi-scale modeling; Conclusions and future plans.
Derived from text
Microelectromechanical Systems; Plastic Properties; Tensile Tests; Nanoindentation

20020076330 Swedish Defence Research Establishment, Aeronautics Div., Stockholm Sweden
Fatigue Resistance of Composite Joints with Countersunk Composite and Metal Fasteners
Starikov, R.; Schoen, J.; May 2001; 24p
Report No.(s): PB2002-106829; FOI-R-0035-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Composite bolted joints were tested in cyclic loading to obtain results of the joint resistance to fatigue. Specimen plates manufactured from carbon fiber/epoxy material system were joined by fasteners of three different types: composite, titanium Torque-set, and titanium Huck-comp. Strain gauge measurements were carried out to analyze strain distribution and the load transfer between the bolt rows. An extensometer was used to measure relative displacement between two composite plates.
NTIS
Fatigue Life; Bolted Joints; Metal Joints; Epoxy Matrix Composites

20020076458 ESDU International Ltd., London, UK
Flexibility of, and load distribution in, multi-bolt lap joints subject to in-plane axial loads
October 2001; In English; Available from ESDU International as part of the ESDU Series on Structures.
Report No.(s): ESDU-98012; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU 98012 introduces a FORTRAN program, ESDUpac A9812 provided both as source code and in compiled form, that computes the bolt loads and flexibilities, and joint extension and flexibility of a multi-bolt, single row, lap joint loaded in either axial tension or compression. The analysis allows for joints in which the bolts are of different sizes and are not at a regular pitch and in which the thickness and/or width of the joined plates vary between bolt pitches. The analysis may be applied to symmetric double lap joints and joints with multiple rows of bolts provided the rows are identical. The details of the idealizations adopted are explained, and worked examples illustrate the program input and output formats used. The program requires the joint geometry and material properties and the flexibilities of each of the bolts under shear loading. A theory for the calculation of these flexibilities is also described and may be used when they are not available. The program also requires the effective stiffnesses of the plates and an empirical relationship between effective stiffness and plate modulus and bolt diameter is given. However, it is suggested that, if possible, the effective stiffness of the plate to be used should be determined experimentally, and a suitable test procedure is provided. Detailed notes on the major parameters that influence the bolt loads and joint flexibility are included along with figures that illustrate those influences. The joint stiffness value calculated will be particularly useful to represent such a joint when using finite element analysis to determine the gross load distribution through a structure.

ESDU

Applications Programs (Computers); Axial Loads; Lap Joints; Load Distribution (Forces); Bolted Joints; Structural Analysis; Compression Loads

20020076469 ESDU International Ltd., London, UK

Elasto-plastic buckling of flat isotropic stiffened panels and struts under compression

May 2001; In English; Available from ESDU International as part of the ESDU Series on Structures.

Report No.(s): ESDU-01001; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU (Engineering Sciences Data Unit) 01001 introduces FORTRAN programs (ESDUpacs A0101 and B0101, provided as source code and in compiled form) for calculating the initial elasto-plastic buckling (local, flexural, torsional or torsional-flexural) loads for flat rectangular panels and struts using the finite strip method, the method that is used and described in ESDU 98016. When applied to periodic displacement conditions like buckling, this method provides more rapid solutions than finite element analysis. Predefined skin-stringer sections are provided which relieve the user of having to generate the usually large finite strip model data file but, if required, arbitrary cross sections may be defined by the user or, alternatively, the file for one of the predefined sections may be adapted. The predefined stringer sections are beaded or unbeaded T, I, lipped J, machined or rolled sheet lipped Z, machined unlipped Z and machined or rolled sheet top-hat. For the rolled sheet sections the corner radius is modelled. A special single-stringer panel model is included to represent a panel with many stringers. It uses predefined edge conditions in conjunction with the predefined sections and allows rapid exploration of the effect of changes in geometrical parameters and material properties. Adhesive layer and rivet elements are included to enable the stringer/skin joint to be modelled in a more realistic way, but inter-rivet buckling is not considered. Full account is taken of plastic material behavior and three elasto-plastic stress-strain curve models are available to the user; two are variants of the Ramberg-Osgood model and the third is a model that allows the specification of a linear relationship between stress and strain below a particular stress-strain level. Up to ten different materials may be used in the models, although rolled sheet sections are assumed to be formed of one material. The number of stringers is restricted to between 10 and 18 depending on the type of stringer but those values may be increased if necessary. Edge conditions are modelled by adding or removing nodal degrees of freedom. There are three analysis options: the load associated with a buckled half-wavelength equal to the simply-supported panel length, a complete curve of load against buckled half-wavelength, or a specific minimum buckling load from the curve. The construction of the input to the programs and the format of the output are explained and illustrated with worked examples. Warning messages are explained. A comparison is made of results obtained with the programs and data in other ESDU documents. ESDUpac A0101 is provided in a form that prompts on-screen for input data.

ESDU

Applications Programs (Computers); Buckling; Elastoplasticity; Finite Element Method; Isotropy; Rectangular Panels; Stringers; Struts; Structural Stability; Computerized Simulation

42
GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20020075732 Geological Survey, Denver, CO USA
Response Plan for Volcano Hazards in the Long Valley Caldera and Mono Craters Region California
Hill, D. P.; Dzurisin, D.; Ellsworth, W. L.; Endo, E. T.; Galloway, D. L.; 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-106850; USGS-BULL-2185; No Copyright; Avail: National Technical Information Service (NTIS)

Persistent unrest in Long Valley Caldera characterized by recurring earthquake swarms, inflation of the resurgent dome in the central sections of the caldera, and emissions of magmatic carbon dioxide around Mammoth Mountain during the last two decades and continuing into the 21st century emphasize that this geologically youthful volcanic system is capable of further volcanic activity. This document describes the U.S. Geological Surveys (USGS) response plan for future episodes of unrest that might augur the onset of renewed volcanism in the caldera or along the Inyo-Mono Craters chain to the north. Central to this response plan is a four-level color code with successive conditions, GREEN (no immediate risk) through RED (eruption under way), reflecting progressively more intense activity levels as summarized in table 1 and 2 and described in detail in section II.
NTIS
Calderas; Earthquakes; Geological Surveys; Volcanology; California; Craters

20020075734 Geological Survey, Water Resources Div., Bismarck, ND USA
Water Resources Data North Dakota, Water Year 2001. Volume 2. Ground Water ***Annual Report, 1 Oct. 00 - 30 Sep. 01***
Harkness, R. E.; Wald, J. D.; Mar. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-106753; USGS-WDR-ND-01-2; No Copyright; Avail: National Technical Information Service (NTIS)

Water-resources data for the 2001 water year for North Dakota consists of records of discharge, stage, and water quality for streams; contents, stage, and water quality for lakes and reservoirs; and water levels and water quality for ground-water wells. Volume 2 contains water-level records for 111 ground-water wells and water-quality records for 22 monitoring wells. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Federal, State, and local agencies in North Dakota.
NTIS
Geological Surveys; Ground Water; Water Quality; Hydrology; North Dakota

20020075735 Geological Survey, Water Resources Div., Sacramento, CA USA
Water Resources Data California, Water Year 2001. Volume 2. Pacific Slope Basins from Arroyo Grande to Oregon State Line except Central Valley ***Annual Report, 1 Oct. 00 - 30 Sep. 01***
Friebel, M. F.; Freeman, L. A.; Smithson, J. R.; Webster, M. D.; Anderson, S. W.; May 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available in CD-ROM
Report No.(s): PB2002-106750; USGS-WDR-CA-01-2; No Copyright; Avail: National Technical Information Service (NTIS)

Water-resources data for the 2001 water year for California consist of records of stage, discharge, and water quality of streams, stage and contents in lakes and reservoirs, and water levels and water quality in wells. Volume 2 contains discharge records for 128 gaging stations, stage and contents for 6 lakes and reservoirs, gage-height records for 8 stations, water quality for 43 streamflow-gaging stations and 2 partial-record stations, and precipitation data for 1 station. Also included are data for 1 low-flow partial-record station, and 8 miscellaneous-measurement stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California.
NTIS
Water Resources; Hydrology; Slopes; River Basins; Arroyos; Geological Surveys; California

20020075737 Geological Survey, Water Resources Div., Northborough, MA USA
Glacial Geology and Aquifer Characteristics of the Big River Area, Central Rhode Island ***Final Report***
Stone, J. R.; Dickerman, D. C.; 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-108643; USGS-WRI-01-4169; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Introduction; Glacial geology; Aquifer characteristics; References; Figures and Tables.
NTIS
Aquifers; Geology; Rivers; Glaciology

20020075738 Washington State Univ., Transportation Center, Pullman, WA USA
Seismic Instrumentation for the Alaskan Way Viaduct
Jun. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM and in paper copy
Report No.(s): PB2002-108719; No Copyright; Avail: National Technical Information Service (NTIS)

The Alaskan Way Viaduct, which runs along the Seattle waterfront, is highly susceptible to damage during earthquakes. Previous studies have shown that extensive soil liquefaction could cause collapse of sections of the Viaduct through a complex mechanism that involves the seismic performance of a nearby seawall. Occurrence of such collapse events would be expected to occur at some time after the initiation of earthquake shaking, thereby providing some period of time in which motorists could potentially be kept from entering the Viaduct. The purpose of this project was to evaluate the feasibility of instrumenting the Viaduct to (1) provide warning of potentially unsafe situations, and (2) reduce post-earthquake closure times by speeding the process of evaluating the condition of the Viaduct following earthquake shaking. Because of the numerous and significant sources of uncertainty in the prediction of collapse, a probabilistic approach to the warning system problem was adopted. This procedure accounted for, to the extent possible given available information, uncertainties in ground shaking characteristics, uncertainties in soil properties, uncertainties in seawall behavior, uncertainties in Viaduct foundation behavior, and uncertainties in structural response. The results are expressed in estimated collapse probabilities for various warning system triggering levels. Selection of triggering levels will require balancing the costs and benefits of successful and unsuccessful collapse predictions. Structural analyses of specific sections of the Viaduct were used to develop recommendations for performance monitoring instrumentation. Proposed response levels for inspection and inspection/closure are also presented.
NTIS
Earthquakes; Seismology; Liquefaction; Soil Science

20020076081 Oak Ridge National Lab., TN USA
Southern Appalachian Man and Biosphere Program: A Model for Management Need-Based Research
Van Sickle, C.; Turner, R. S.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-108871; No Copyright; Avail: National Technical Information Service (NTIS)

The story of the Southern Appalachian Man and the Biosphere (SAMAB) Program is an illustration of how one such organization was conceived and how it operates. The mission of SAMAB is to promote the environmental health and stewardship of natural, economic, and cultural resources in the Southern Appalachians. It encourages community-based solutions to critical regional issues through cooperation among partners, information gathering and sharing, integrated assessments, and demonstration projects.
NTIS
Appalachian Mountains (North America); Biosphere; Ecosystems; Land Use; Cultural Resources

20020076164 Interior Dept., Office of Surface Mining Reclamation and Enforcement, Washington, DC USA
Permitting Hydrology. A Technical Reference Document for Determination of Probable Hydrologic Consequences (PHC) and Cumulative Hydrologic Impact Assessments (CHIA). Baseline Data
May 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-108952; No Copyright; Avail: National Technical Information Service (NTIS)

This document covers a wide range of topics, including: potential hydrologic impacts; baseline information; quality assurance/quality control procedures; technical software are data management; national data bases and regional examples of baseline information summarized from an eastern site, a mid-continent site and a western site.
NTIS
Data Management; Hydrology; Mining; Geology

20020076196 Geological Survey, Water Resources Div., Reston, VA USA

Streamflow Information for the Next Century: A Plan for the National Streamflow Information Program of the U.S. Geological Survey

1999; In English

Report No.(s): PB2002-108941; USGS-OFR-99-456; No Copyright; Avail: CASI; C01, CD-ROM

The proposed plan of the National Streamflow Information Program is to increase the level of streamflow information for National needs; to improve the way streamgaging stations are funded and located; and of new ways to collect, store, and distribute streamflow information.

NTIS

Data Acquisition; Streams; Flow Measurement; Water Flow

20020076238 Rocky Mountain Research Station, Fort Collins, CO USA

Dynamics of a Pinyon-Juniper Stand in Northern Arizona: A Half-Century History

Ffolliott, P. F.; Gottfried, G. J.; Feb. 2002; 20p; In English

Report No.(s): PB2002-108295; RMRS-RP-35; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper adds to the limited knowledge of stand dynamics in pinyon-juniper woodlands by reporting in the changes in species composition, numbers of trees, arrangement of trees, and total height and volume in a stand from late 1938 to early 1991. This information should be helpful in managing pinyon-juniper woodlands to sustain their productivity and maintain their multiple-use values. The annual increase of 1.2 trees per acre does not reflect the massive invasion of trees suspected by many people.

NTIS

Trees (Plants); Arizona; Histories; Forest Management

20020076242 Geological Survey, Water Resources Div., Reston, VA USA

Subsurface and Petroleum Geology of the Southwestern Santa Clara Valley ('Silicon Valley'), California

Stanley, R. G.; Jachens, R. C.; Lillis, P. G.; McLaughlin, R. J.; Kvenvolden, K. A.; Feb. 2002; 64p

Report No.(s): PB2002-108922; DI-USGS-PP-1663; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report summarizes our investigation of the subsurface and petroleum geology of the southwestern Santa Clara Valley, using (1) available data from historical exploratory oil wells and oil seeps, (2) new interpretations of isostatic-gravity anomalies and aeromagnetic surveys, (3) new organicgeochemical analyses of oil and potential petroleum-source rocks, and (4) new stratigraphic and structural information from outcrops along the valley margin. The results demonstrate that the southwestern Santa Clara Valley is underlain by a concealed, oil-bearing sedimentary basin consisting largely of Miocene marine sedimentary rocks (including the Monterey Formation) that, in places, are more than 3 km thick.

NTIS

California; Geology; Crude Oil; Oil Exploration

20020076253 Geological Survey, Water Resources Div., Columbus, OH USA

Techniques for Estimating Selected Streamflow Characteristics of Rural, Unregulated Streams in Ohio *Final Report*

Koltun, G. F.; Whitehead, M. T.; Nov. 2001; 62p; In English

Report No.(s): PB2002-108576; USGS-WRIR-02-4068; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report provides equations for estimating mean annual streamflow, mean monthly streamflows, harmonic mean streamflow, and streamflow quartiles (the 25th-, 50th- and 75th-percentile streamflows) as a function of selected basin characteristics for rural, unregulated streams in Ohio. The equations were developed from streamflow statistics and basin-characteristics data for as many as 219 active or discontinued streamflow-gaging stations on rural, unregulated streams in Ohio with 10 or more years of homogeneous daily streamflow record. Streamflow statistics and basin-characteristics data for the 219 stations are presented in this report. Simple equations (based on drainage area only) and best-fit equations (based on drainage area and at least two other basin characteristics) were developed by means of ordinary least-squares regression techniques. Application of the best-fit equations generally involves quantification of basin characteristics that require or are facilitated by use of a geographic information

NTIS

Drainage; Estimating; Quartiles; Rural Areas; Laminar Flow

20020076314 State Agricultural Univ., Wageningen, Netherlands

Sensitivity of Output Covariance to Non-Second Order Properties of the Input in the Case of Unsaturated Zone Models

Wojcik, R.; Torfs, P. J. F.; Ignar, S.; Jun. 1998; 64p; In English

Report No.(s): PB2002-105044; REPT-80; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The classical way of doing Monte Carlo analysis is: starting from the covariance of the input, generate a great number of possible inputs, present them to the model and deduce from all generated outputs the covariance of the output. This procedure is widely used in unsaturated zone hydrology research. Theoretically it is clear that if the model is non-linear (and unsaturated zone models are non-linear) the covariance of the output depends also on non-covariance properties of the input. In this paper an easy method of investigating the sensitivity of the output to the non-covariance properties of the input will be presented. The method is based on Fourier analysis and changing the phases of transforms.

NTIS

Monte Carlo Method; Covariance; Hydrology; Output

20020076322 Geological Survey, Water Resources Div., New Cumberland, PA USA

Geohydrology and Ground-Water Quality, Big Elk Creek Basin, Chester County, Pennsylvania, and Cecil County, Maryland

Sloto, R. A.; 2002; 92p; In English; This document is color dependent and/or in landscape layout. It is currenty only available on CD-ROM

Report No.(s): PB2002-108148; USGS/WRI-02-4057; No Copyright; Avail: National Technical Information Service (NTIS)

This report presents and interprets groundwater quantity and quality data for the Big Elk Creek Basin in Chester County, Pa., and Cecil County, Md. The report focuses primarily on the Pennsylvania part of the basin. The report describes the geohydrology of aquifers in the basin and presents a summary of ground-water quality. Basin water budgets for the calendar years 1998 and 1999 are presented using streamflow data from the USGS streamflow-measurement station on Big Elk Creek and ground-water-level and precipitation data collected for this study.

NTIS

Hydrogeology; Ground Water; Water Quality; Aquifers; Water Sampling

20020076325 Geological Survey, Denver, CO USA

Geophysical Mapping of Saltwater Intrusion in Everglades National Park

Fitterman, D. V.; DeszczPan, M.; 2002; In English; This document is color dependent and/or in landscape layout. It is currenty only available on CD-ROM

Report No.(s): PB2002-108343; No Copyright; Avail: National Technical Information Service (NTIS)

The mapping of saltwater intrusion in coastal aquifers has traditionally relied upon observation wells and collection of water samples. This approach may miss important hydrologic features related to saltwater intrusion in areas where access is difficult and wells are widely spaced, such as the Everglades. to map saltwater intrusion in Everglades National Park, a different approach has been used. We have relied heavily on helicopter electromagnetic (HEM) measurements to map lateral variations of electrical resistivity, which are directly related to water quality. The HEM data are inverted to provide a three-dimensional resistivity model of the subsurface. Borehole geophysical and water quality measurements made in a selected set of observations wells are used to determine the relation between formation resistivity and specific conductance of pore water. Applying this relation to the 3-D HEM resistivity model produces an estimated water-quality model. This model provides constraints for variable density, ground-water models of the area. Time-domain electromagnetic (TEM) soundings have also be used to map saltwater intrusion.

NTIS

Sea Water; Everglades (FL); Intrusion; Surveys; Geophysics; Electrical Resistivity; Water Quality

20020076326 Geological Survey, Water Resources Div., Tallahassee, FL USA

Freshwater Flow from Estuarine Creeks into Northeastern Florida Bay ***Final Report***

Hittle, C.; Patino, E.; Zucker, M.; 2001; In English; This document is color dependent and/or in landscape layout. It is currenty only available on CD-ROM

Report No.(s): PB2002-108352; USGS-WRI-01-4164; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this report is to describe the magnitude and distribution of flows at nine estuarine creeks within the mangrove zone along the northeastern coast of Florida Bay. Procedures used at five instrumented sites to calculate the cross-sectional area are presented in detail, and analyses made to establish the relations between acoustic line velocity and mean water velocity for the computation of discharge are presented. Estimation techniques also are presented for determining flows at four noninstrumented sites and for the selection of a base gage to indicate possible effects that changes in water-management practices

may have on the freshwater flow into northeastern Florida Bay. General flow patterns are described by presenting seasonal variations in discharge and salinity during wet- and dry-season months and the spatial distribution of discharge from east to west along the coastline.
NTIS
Water Flow; Fresh Water; Estuaries; Spatial Distribution; Flow Velocity

20020076327 Geological Survey, Water Resources Div., Tallahassee, FL USA
Surface-Geophysical Characterization of Ground-Water Systems of the Caloosahatchee River Basin, Southern Florida
Cunningham, K. J.; Locker, S. D.; Hine, A. C.; Burkry, D.; Barron, J. A.; 2001; In English; This document is color dependent and/or in landscape layout. It is currenty only available on CD-ROM
Report No.(s): PB2002-108351; No Copyright; Avail: National Technical Information Service (NTIS)

The Caloosahatchee River Basin, located in southwestern Florida, includes about 1,200 square miles of land. The Caloosahatchee River receives water from Lake Okeechobee, runoff from the watershed, and seepage from the underlying ground-water systems; the river loses water through drainage to the Gulf of Mexico and withdrawals for public water supply and agricultural and natural needs. In this study, marine seismic reflection and ground-penetrating radar techniques were used as a means to evaluate the potential for flow between the river and ground-water systems. Seven test boreholes were drilled to calibrate lithostratigraphic units, their stratal geometries, and estimated hydraulic conductivities to surface-geophysical profiles.
NTIS
Stratigraphy; Ground Water; Water Flow; Geophysics; Rivers; Surveys

20020076328 Geological Survey, Water Resources Div., Reston, VA USA
Classification of Vegetation for Surface-Water Flow Models in Taylor Slough, Everglades National Park
Carter, V.; Rybicki, N. B.; Reel, J. T.; Ruhl, H. A.; Stewart, D. W.; 2002; In English
Report No.(s): PB2002-108349; No Copyright; Avail: CASI; C01, CD-ROM

Surface-water flow velocity in the wetlands of Taylor Slough, Everglades National Park, is controlled by factors such as water depth, land-surface gradient, wind effects, and the type and density of vegetation. In order to evaluate the effect of vegetation on this shallow surface-water flow for model development, it is necessary to extrapolate from point measurements of velocity and surface-water slope made concurrently with characterization of vegetation at locations throughout the slough to the entire model area. At these flow measuring locations, vegetation, including periphyton, was harvested in horizontal layers, either 10 cm or 20 cm thick, from the bed through the water column to the top of the plants, in 0.5-m square quadrats. Species composition, density, leaf and (or) culm number and size, biomass, and leaf area index were determined for each layer. The vegetation samples were grouped into classes by species composition and biomass.
NTIS
Vegetation; Surface Water; Water Flow; Everglades (FL); Wetlands

20020076333 Geological Survey, Water Resources Div., Denver, CO USA
Use of Temperature, Pressure, and Water Potential Data to Estimate Infiltration and Monitor Percolation in Pagany Wash Associated with the Winter of 1997-98 El Nino Precipitation, Yucca Mountain, Nevada
LeCain, G. D.; Lu, N.; Kurzmack, M.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-106820; USGS/WRI-02-4035; No Copyright; Avail: National Technical Information Service (NTIS)

Temperature, pressure, and water potential monitoring in two vertical boreholes at Pagany Wash near Yucca Mountain in Nevada indicated infiltration and deep percolation through and alluvium. Temperature data indicated that the annual temperature wave was measurable to a depth of 12.2 meters. Water potential values ranged from -3 to -1 bars. Temperature, pressure, and water potential disruptions were measured at a depth of 35.2 meters. The disruptions were interpreted to be the result of the percolation of infiltrated water associated with the winter of 1997-98 El Nino precipitation.
NTIS
Infiltration; Percolation; Boreholes; Alluvium

20020076339 National Oceanic and Atmospheric Administration, Great Lakes Environmental Research Lab., Ann Arbor, MI USA

Abundance, Biomass, and Species Composition of Benthic Macroinvertebrate Populations In Saginaw Bay, Lake Huron, 1987-96

Nalepa, T. F.; Fanslow, D. L.; Lansing, M. B.; Lang, G. A.; Ford, M.; May 2002; 36p; In English

Report No.(s): PB2002-107294; GLERL-122; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This technical report gives the basic results of benthic macroinvertebrate surveys conducted over this time period to assess trends in macroinvertebrate density, biomass, and species composition. When the surveys were initiated in 1987-88, the main objective was to assess the response of the benthic community to phosphorus abatement programs that were implemented in the mid-1970s. Improvements in water quality were reported after these program, and a two-year sampling program in 1987-88 was designed to determine if similar improvements were evident in the macroinvertebrate community. When the zebra mussel (Dreissena polymorpha) became established in the Great Lakes in 1988, sampling was resumed in 1990 and continued through 1996 with the objective of assessing impacts of Dreissena. Dreissena colonized the bay in 1991. Thus, the data collected during the time of this study can be divided into two distinct periods: post-phosphorous abatement/pre-Dreissena (1987-90) and post-Dreissena (1991-96).

NTIS

Lake Huron; Invertebrates; Biomass; Beds (Geology)

20020076350 Geological Survey, Water Resources Div., Bismarck, ND USA

Historic and Unregulated Monthly Streamflow for Selected Sites in the Red River of the North Basin in North Dakota, Minnesota, and South Dakota, 1931-99 ***Final Report***

2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM

Report No.(s): PB2002-109019; USGS/WRI-02-4095; No Copyright; Avail: National Technical Information Service (NTIS)

This report describes the compilation and analysis of the monthly streamflow data needed as input to a comprehensive water-quality model. The specific objectives were: (1) compile and estimate the historic monthly streamflow data for January 1931 through September 1999 (the data-development period) for 35 sites within the Red River of the North Basin, 12 of which are in the Sheyenne River Basin; and (2) estimate the unregulated monthly streamflow data for 1931-99 for the 35 sites. The 35 sites include gaging stations for which some data are available and sites for which no data are available.

NTIS

Water Quality; Estimates; Water Flow; Water Management

20020076363 Geological Survey, Water Resources Div., Iowa City, IA USA

Simulation of Ground-Water Flow and Delineation of Areas Contributing Recharge to Municipal Water-Supply Wells, Muscatine, Iowa

Savoca, M. E.; Lucey, K. J.; Lanning, B. D.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): PB2002-106819; USGS/WRI-02-4004; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this report is to describe the methods used to delineate areas contributing recharge to municipal water-supply wells in Muscatine, Iowa, and to present the results of those delineations for 1998 pumping conditions. The steady-state ground-water flow model constructed by Lucey and others (1995) was modified to discretize the three model layers into 200-ft by 200ft cells.

NTIS

Ground Water; Hydrology Models; Water Flow; Delineation

20020076365 Geological Survey, Water Resources Div., Augusta, ME USA

Water Resources Data Maine, Water Year 2001 ***Annual Report, 1 Oct. 2000 - 30 Sep. 2001***

Stewart, G. J.; Nielsen, J. P.; Caldwell, J. M.; Cloutier, A. R.; Mar. 2002; 260p; In English

Report No.(s): PB2002-106758; USGGS-WDR-ME-01-1; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The Water Resources Division of the U.S. Geological Survey, in cooperation with State, Federal, and other local governmental agencies, obtains a large amount of data pertaining to the water resources of Maine each year. These data, accumulated during the many water years, constitute a valuable data base for developing an improved understanding of the water resources of the State. Water-resources data for the 2001 water year for Maine consists of records of stage, discharge, ground water levels, water quality of streams and ground-water wells, precipitation quantity, and snow quantity. This report contains discharge records for: 5 gage-height stations, 58 discharge gaging stations, stream water-quality data for 3 stations, water levels for 17

ground-water wells, water-quality data for 1 ground-water well, precipitation quantity data for 12 stations, and snow quantity data for 82 stations. Additional water data were collected at other sites, not part of the systematic data-collection program, and are published as special study and miscellaneous record sections.
NTIS
Water Resources; Ground Water; Data Acquisition; Geological Surveys; Data Bases

20020076366 Geological Survey, West Trenton, NJ USA
Water Resources Data for New Jersey, Water Year 2001, Volume 2, Ground-Water Data ***Annual Report, 1 Oct. 2000 - 30 Sep. 2001***
Jones, W. D.; Edwards, R. W.; 2001; 252p; In English
Report No.(s): PB2002-106755; USGS/WDR/NJ-01-Vol-2; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche
Water-resources data for the 2001 water year for New Jersey are presented in three volumes, and consists of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. Volume 2 contains a summary of the hydrologic conditions for 2001 water year; a listing of current water resource projects in New Jersey; a bibliography of water-related reports, articles, and fact sheets completed by the Geological Survey in recent years; records of ground-water levels from 193 wells; and a table of discontinued observation wells for which ground-water-level data are available. The locations of the ground-water level sites are shown on figure 4. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Federal, State, and local agencies in New Jersey.
NTIS
Water Resources; Ground Water; Waste Water; Geological Surveys; Data Systems

20020076412 Geological Survey, Water Resources Div., Tallahassee, FL USA
Inventory and Review of Aquifer Storage and Recovery in Southern Florida
Reese, R. S.; 2002; In English
Report No.(s): PB2002-108353; USGS/WRI-02-4036; No Copyright; Avail: National Technical Information Service (NTIS)
Aquifer storage and recovery in southern Florida has been proposed on an unprecedented scale as part of the Comprehensive Everglades Restoration Plan. Aquifer storage and recovery wells were constructed or are under construction at 27 sites in southern Florida, mostly by local municipalities or counties located in coastal areas. The Upper Floridan aquifer, the principal storage zone of interest to the restoration plan, is the aquifer being used at 22 of the sites. The aquifer is brackish to saline in southern Florida, which can greatly affect the recovery of the freshwater recharged and stored. Well data were inventoried and compiled for all wells at most of the 27 sites. Construction and testing data were compiled into four main categories: (1) well identification, location, and construction data; (2) hydraulic test data; (3) ambient formation water-quality data; and (4) cycle testing data. Each cycle during testing or operation includes periods of recharge of freshwater, storage, and recovery that each last days or months. Cycle testing data include calculations of recovery efficiency, which is the percentage of the total amount of potable water recharged for each cycle that is recovered.
NTIS
Aquifers; Wells; Water Reclamation; Construction

20020076416 Department of Energy, Yucca Mountain Site Characterization Project Office, Las Vegas, NV USA
Calibrated Properties Model
Liu, H. H.; Ahlers, C. F.; Dec. 18, 2001; 146p; In English
Report No.(s): DE2001-795790; MOL.20020311.0012; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The purpose of this Analysis/Model Report (AMR) is to document the Calibrated Properties Model that provides calibrated parameter sets for unsaturated zone (UZ) flow and transport process models for the Yucca Mountain Site Characterization Project (YMP). This work was performed in accordance with the AMR Development Plan for U0035 Calibrated Properties Model REV00 (CRWMS M&O 1999c). These calibrated property sets include matrix and fracture parameters for the UZ Flow and Transport Model (UZ Model), drift seepage models, drift-scale and mountain-scale coupled-processes models, and Total System Performance Assessment (TSPA) models as well as Performance Assessment (PA) and other participating national laboratories and government agencies. These process models provide the necessary framework to test conceptual hypotheses of flow and transport at different scales and predict flow and transport behavior under a variety of climatic and thermal-loading conditions.
NTIS
Mathematical Models; Fluid Flow

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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.

20020074722 Lunar and Planetary Inst., Houston, TX USA
Solar System Remote Sensing
2002; ISSN 0161-5297; 106p; In English, 20-21 Sep. 2002, Pittsburgh, PA, USA; Sponsored by Pittsburgh Univ., USA; Also announced as 20020074723 through 20020074770
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1129; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This volume contains abstracts that have been accepted for presentation at the symposium on Solar System Remote Sensing, September 20-21, 2002, in Pittsburgh, Pennsylvania. Administration and publications support for this meeting were provided by the staff of the Publications and Program Services Departments at the Lunar and Planetary Institute.
Author
Remote Sensing; Solar System; Conferences; Astronomical Spectroscopy; Optical Equipment

20020074736 Cornell Univ., Center for Radiophysics and Space Research, Ithaca, NY USA
A New Method for Estimating the Single Scattering Phase Functions of Regolith Grains
Helfenstein, P., Cornell Univ., USA; Solar System Remote Sensing; 2002, pp. 27-28; In English; Also announced as 20020074722
Contract(s)/Grant(s): NAGW-3639; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Hapke's photometric model has been widely used in solar system remote sensing applications for nearly two decades. Recently, Hapke extended his model to describe the coherent-backscatter opposition effect and multiple-scattering by particles with anisotropic single particle phase functions (SPPF's). A practical difficulty for retrieving Hapke's model parameters from typical planet, satellite, and asteroid photometry data sets is that the model employs a large number of adjustable parameters (at least eight) that can be reliably constrained only for a small number of planetary data sets in which both disk-resolved and whole-disk observations are available from opposition to very large phase angles. The present work aims to reduce the number of adjustable parameters and preserve (or even enhance) the model's accuracy and usefulness by expressing Hapke's parameters in terms of more fundamental physical properties on which they mutually depend. The most difficult part of this task, described here, is to develop a simple method for computing the effective SPPF for structurally complex regolith grains from optical constants, grain-size distribution, and average regolith porosity. The development of light-scattering models for irregularly shaped particles is a large, complex subject and many sophisticated methods, such as Discrete Dipole Approximation (DDA) and Monte-Carlo simulations, have been explored elsewhere. Many of these methods are computationally intensive and probably impractical for routine substitution in Hapke's model. Here, progress is reported in developing a practical, semi-empirical method for estimating the directional scattering behavior (i.e. SPPF) of irregular regolith grains. The method employs Optical Transfer Function (OTF) techniques to model how the structural complexity of regolith particles broaden and attenuate the angular distribution of scattered light relative to that expected from ideal spherical particles of equivalent size and composition.
Author
Grain Size; Optical Transfer Function; Optical Properties; Stellar Spectrophotometry; Planetary Surfaces; Models; Data Acquisition

20020075972 Argonne National Lab., IL USA
Estimating long-term surface hydrological components by coupling remote sensing observation with surface flux model
Song, J.; Wesely, M. L.; May 02, 2002; 10p; In English
Report No.(s): DE2001-795809; ANL/ER/CP-107556; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A model framework for parameterized subgrid-scale surface fluxes (PASS) has been applied to use satellite data, models, and routine surface observations to infer root-zone available moisture content and evapotranspiration rate with moderate spatial resolution within Walnut River Watershed in Kansas. Biweekly composite normalized difference vegetative index (NDVI) data are derived from observations by National Oceanic and Atmospheric Administration (NOAA) satellites. Local surface observations provide data on downwelling solar irradiance, air temperature, relative humidity, and wind speed. Surface parameters including roughness length, albedo, surface water conductance, and the ratio of soil heat flux to net radiation are estimated; pixel-specific near-surface meteorological conditions such as air temperature, vapor pressure, and wind speed are adjusted according to local surface forcing. The PASS modeling system makes effective use of satellite data and can be run for large areas for which flux data do not exist and surface meteorological data are available from only a limited number of ground stations. The long-term surface hydrological budget is evaluated using radar-derived precipitation estimates, surface meteorological observations, and satellite data. The modeled hydrological components in the Walnut River Watershed compare well with stream gauge data and observed surface fluxes during 1999.
NTIS
Remote Sensing; Hydrology; Heat Flux; Meteorological Parameters; Surface Roughness

20020076120 Sensit Technologies, Inc., Portland, ND USA
Monitoring Earth's Ecosystems
Spinoff 1997; 1997, pp. 95; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Partnered with Goddard Space Flight Center, Sensit Technologies Inc. developed a third-generation Portable Apparatus for Rapid Acquisitions of Bidirectional Observations of Land and Atmosphere, or PARABOLA III for short. Now commercially available, PARABOLA III is designed to measure the reflected signature of a variety of Earth surface types, from rangeland vegetation to ice and snow. It can rapidly acquire data for almost the complete sky and ground-looking hemispheres, with no missing data and sufficient dynamic range to measure direct solar radiance. The instrument was actively used in the Boreal Ecosystem- Atmosphere Study which provided useful information in designing a Multi-angle Imaging SpectroRadiometer, a small satellite being built by the Jet Propulsion Laboratory that will measure sunlight reflected by the Earth into space.
Author
Earth Surface; Ecosystems; Satellites; Spectroradiometers; Imaging Techniques

20020076239 National Oceanic and Atmospheric Administration, Rockville, MD USA
Nautical Charting Plan: Nautical Charts Play a Key Role in Providing Safe Passage (Fourth Edition)
Aug. 1999; In English
Report No.(s): PB2002-108568; No Copyright; Avail: CASI; C01, CD-ROM

This presentation covers the following topics: nautical charting plans of major U.S. port cities, chart coverage of critical areas, the U.S. Electronic Navigational Chart program and Planned Electronic Navigational Chart Coverage.
NTIS
Nautical Charts; Ports; USA

20020076288 Environmental Protection Agency, National Exposure Research Lab, Las Vegas, NV USA
Remote Sensing and Geographic Information Systems for Decision Analysis in Public Resource Administration: A Case Study of 25 Years of Landscape Change in a South-Western Watershed
Kepner, W. G.; Edmonds, C. M.; Watts, C. J.; Jun. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-107522; EPA/600/R-02/039; NERL-LV-ESD-02-061; No Copyright; Avail: CASI; C01, CD-ROM

Alternative futures analysis is a scenario-based approach to regional land planning that attempts to synthesize existing scientific information in a format useful to community decision-makers. Typically, this approach attempts to investigate the impacts of several alternative sets of choices preferred by representative stakeholder groups relative to selected environmental or economical endpoints. Potential impacts from each of the scenarios are compared to current conditions of the region in terms of a set of processes that are modeled within a geographic information system. Future conditions are generally examined from the perspective of a recent baseline condition (versus empirically determined using a series of retrospective measurements). During the past two decades, important advances in the integration of remote imagery, computer processing, and spatial analysis technologies have been linked to the study of distribution patterns of communities and ecosystems and the ecological processes that affect these patterns. Because of the 25+ year availability of commercial satellite imagery, it is possible to examine environmental change and establish models which can narrow the actual choice of possible and probable change scenarios. This

research (1) examines the potential to establish reference condition and measure change over large geographic areas; (2) determine trends in environmental condition; and (3) model and predict future landscape scenarios using advanced space-based technologies. Specifically, landscape pattern measurements were developed from satellite remote sensing, spatial statistics, and geographic information systems technology for a semi-arid watershed in southeast Arizona and northeast Sonora, Mexico and evaluated for their use in a decision-making framework.
NTIS
Geographic Information Systems; Remote Sensing; Watersheds; Regional Planning; Systems Analysis; Topography; Information Resources Management

20020076357 Eidgenoessische Technische Hochschule, Zurich, Switzerland
Modelling of Glacier and Snow Melt Processes within the Hydrological Catchment Model WaSiM-ETH
Klok, L.; Roelofsma, K.; Apr. 1999; 124p; In English
Report No.(s): PB2002-105890; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Glaciers play an important role in the hydrological processes of partly glacierized areas in mountainous or arctic areas. During the melt season, glaciers contribute significant quantities of melt water to the discharge of partly glacierized catchment areas. Glaciers store precipitation during winter. Until now, no hydrological models existed with the ability to simulate discharges of partly glacierized areas since glacier melt processes were not simulated within these models. Therefore, the water balance of many mountainous areas and the daily discharge fluctuations during the melt season could not be accurately calculated. The aim of this research was to incorporate a submodel, which simulates glacier melt processes, into the hydrological model WaSiM-ETH (Water-balance Simulation Model), in order to apply WaSiM-ETH to partly glacierized catchment areas.
NTIS
Glaciers; Snow; Mathematical Models; Water Balance; Hydrology Models

20020077956 Boston Univ., Dept. of Geography, Boston, MA USA
Investigation of Aerodynamic and Radiometric Land Surface Temperatures ***Final Report, Period ending 30 Jun. 2002***
Friedl, Mark, Boston Univ., USA; Crago, Richard D., Bucknell Univ., USA; Kustas, William, Agricultural Research Service, USA; Wang, Yeqiao, Rhode Island Univ., USA; Aug. 30, 2002; 5p; In English
Contract(s)/Grant(s): NAG5-8584; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The surface temperature, T(sub s), of a land surface measured by a radiometer, T(sub s,r), and the temperature ”felt” by the air, T(sub aero), often differ significantly and are difficult if not impossible to define rigorously. However, recent studies conducted by the principal investigators with several land surface models suggest that this problem can be largely resolved. The main goal of this project was to use model-based and empirical studies to improve understanding and reconcile the difference between T(sub s,r) and T(sub aero), while maintaining consistency within the models and with theory and data. The results from this effort have contributed progress towards the effective use of remotely sensed surface temperature measurements taken from an arbitrary view angle over a partial canopy cover for producing high quality sensible and latent heat flux estimates. In addition, we have developed parameterizations that are designed to improve the representation of the roughness length for heat in climate and mesoscale models. This not only provides improved representation of surface energy balance in such models, but should also facilitate the use of surface temperature measurements for validating or updating the surface temperature produced by SVATs (soil-vegetation-atmosphere schemes) in climate or mesoscale models.
Author
Atmospheric Models; Radiometers; Temperature Measurement; Land Surface Temperature

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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.

20020074790 SRS Technologies, Huntsville, AL USA
Processes and Materials for Flexible PV Arrays
Gierow, Paul A.; Farmer, Gregory D.; Jul. 16, 2002; 8p; In English
Report No.(s): AD-A404968; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Electrical power is a major driver for nearly all classes of space missions and, consequently, the maximization of available power is an on-going challenge. Advanced missions within the Air Force are investigating the use of flexible PV array systems. The rapidly-evolving technology of flexible thin film PV cells lends itself particularly well to a flexible array concept. A parallel incentive for development of flexible PV arrays are the possibilities of synergistic advantages for certain types of spacecraft, in particular the Solar Thermal Propulsion (STP) Vehicle. The large sun-tracking solar concentrators of an STP vehicle present a highly-efficient support and pointing system for a large flexible PV array mounted on the deployed support torus, or the concentrator. The work performed focused on advancing the technologies that will improve and extend the application of solar arrays in a variety of space and aerospace environments. SRS Technologies performed analyses and demonstrated the feasibility of combining thin film PV array technology with methods to manufacture deployable membrane concentrators for solar thermal propulsion. Significant issues addressed were: the interconnection of the newly developed cells, proper thermal control, and electrostatic charge control of the complete system in the space environment. SRS demonstrated a self- metallizing polyimide concept for electrical interconnection of the backplane, and printing PV array interconnect circuitry directly on the thin film prior to lamination to the array. The actions accomplished indicated the feasibility and desirability of a flexible, high specific power, PV array concept and have established a firm foundation and roadmap for development of an operational concept.
DTIC
Electric Power; Extraterrestrial Environments

20020075733 Environmental Protection Agency, Office of Water, Washington, DC USA
Technology Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule
Apr. 2002; 298p; In English
Report No.(s): PB2002-106771; EPA/821/R-02/003; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This profile presents data for the electric power generating industry important for understanding the context of the analyses presented in this document. The majority of this profile is excerpted from Chapter A3 of the Economic and Benefits Analysis for the Proposed Section 316(b) Phase II Existing Facilities Rule (the 'EBA'). For more information on aspects of the industry that may influence nature and magnitude of economic impact of the Proposed Section 316(b) Phase II Existing Facilities Rule, see Chapter A3 of the EBA. The electric power industry is one of the most extensively studied industries. The Energy Information Administration (EIA), among others, publishes a multitude of reports, documents, and studies on an annual basis. This profile is not intended to duplication those efforts. Rather, this profile compiles, summarizes, and presents those industry data that are important in the context of the proposed Phase II rule. For more information of general concepts, trends, and developments in the electric power industry, the last section of this profile, 'References,' presents a select list of other publications on the industry.
NTIS
Technology Utilization; Environmental Surveys; Electric Power Transmission; Electric Generators

20020076012 Idaho National Engineering and Environmental Lab., Idaho Falls, ID USA
Evaluation of the Impact of Off-Design Operation on an Air-Cooled Binary Power Plant (September 22-25, 2002)
Mines, G. L.; Sep. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-797777; INEEL/CON-02-00793; No Copyright; Avail: National Technical Information Service (NTIS)

Geothermal power plants are designed and constructed to provide a rated power output at specific resource and ambient conditions. Due to both diurnal and seasonal changes in the ambient air temperature, as well as a decline in resource productivity over time, plants seldom operate at these 'design' conditions. This paper examines the impact of 'off-design' operation of an air-cooled binary geothermal power plant. An available energy analysis is used to evaluate operation at these conditions. This evaluation identifies those portions of the power cycle that are most sensitive to changing resource and ambient conditions, as well as where improvements in cycle component or system performance would have the largest impact in increasing power output.
NTIS
Geothermal Technology; Geothermal Energy Utilization; Power Plants; Output

20020076172 National Renewable Energy Lab., Golden, CO USA
Photovoltaic Manufacturing Cost and Throughput Improvements for Thin Film CIGS-Based Modules ***Final Report, Jul. 1998 - Sep. 2001***
Britt, J.; Apr. 01, 2002; 52p; In English
Report No.(s): DE2001-15000424; NREL/SR-520-32072; No Copyright; Avail: Department of Energy Information Bridge

This report describes the marked improvements made of the production line under the PVMaT program: successfully developed a high-speed, all-laser, monolithic integration process for CIGS-based modules on polyimide substrates; exceeded

PVMaT goals for scribing rate and total interconnect width; developed robust, well-controlled techniques for selective scribing; improved CIGS evaporation sources to allow uniform, controllable delivery; completed foundation required to integrate higher CIGS deposition rates into the production line; developed well-controlled Se delivery system to minimize Se consumption; successfully integrated the parallel-detector spectroscope ellipsometer (PDSE) into a production CIGS deposition chamber; collected useful, in-situ data with PDSE; validated the performance of the X-ray fluorescometry (XRF) sensor in the production CIGS deposition chamber; and successfully incorporated the XRF sensor into the control architecture of the production CIGS deposition chamber.
NTIS
Manufacturing; Modules; Polyimides; Thin Films; Copper Indium Selenides; Gallium Selenides; Photovoltaic Cells

20020076381 Biomass Research and Development Board, Washington, DC USA
Fostering the Bioeconomic Revolution in Biobased Products and Bioenergy: An Environmental Approach
Jan. 2001; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM
Report No.(s): PB2002-109064; No Copyright; Avail: National Technical Information Service (NTIS)

A revolution spurred by expanded use of renewable biobased products and bioenergy will have enormous impacts in the 21st century. Today, America depends on biomass to provide 3 percent of its energy and more than 300 billion pounds of products annually. Yet, propelled by advances in biological and physical sciences and engineering, America has the opportunity to greatly accelerate its use of biomass. This revolution will have important impacts on our: Economy-stimulating growth, especially in rural, farm and forest economies, and our industries. Environment-by reducing emissions of carbon dioxide and airborne pollutants, reducing soil erosion, sequestering carbon, protecting water supplies and quality, and increasing the diversity of crops and products. Energy security-by increasing domestic production and reducing our enormous dependence on foreign sources of fossil fuels. Competitive position-opening up new technologies, industries, and export opportunities. Industry, government laboratories, academia, and others recognized the importance of biobased products and bioenergy and are developing strategic planning documents including visions and technology roadmaps.
NTIS
Biomass; Biomass Energy Production

20020076442 ESDU International Ltd., London, UK
Computer program for wind speeds and turbulence properties: flat or hilly sites in terrain with roughness changes
December 2001; In English; Available from ESDU International as part of the ESDU Series on Wind Engineering.
Report No.(s): ESDU-01008; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

The purpose of ESDU 01008, which supersedes ESDU 92032, is to provide detailed information on the use of, and background to, the Excel Visual Basic module E0108. This module, which runs in Excel 97 or later, can be used to estimate the variation of wind speed and turbulence properties with height in the atmospheric boundary layer. The module brings together the relevant methods for estimating the effects of terrain roughness changes, gust averaging time and topography (hills, valleys, etc.) described in other ESDU documents. The spreadsheet presentation facilitates repeat runs with changes to the input. The facility is also available to reduce or correct measured wind properties (such as those from a local meteorological station) to values corresponding to standard conditions such as flat, uniform open country terrain, or to obtain corresponding values for some other terrain. The program will calculate wind properties as a function of height over the site including hourly-mean wind speed and maximum gust speed, together with properties of the longitudinal (u) and lateral (v and w) components of turbulence (intensities, integral length scales and spectral densities). The program takes into account the following local conditions. (i) Ground roughness at the site and variations in ground roughness upwind of the site including lateral variations in a terrain patch and the variation of sea-surface roughness with wind speed. (ii) Topographic effects on wind speed due to the location of the site in a hilly region, including ridges, embankments, escarpments or cliffs, or in a valley; topographic effects on turbulence properties for flow over hills with no flow separation. A major feature of the program is its ability to deal with sites in complex terrain where the site is located within a range of hills. The general effect of topography is based on the two-dimensional computational method of Deaves but extended to include three-dimensional effects. The program incorporates a means of dealing with steep topography where flow separations occur and also provides a simplified model for estimating the distortion of spectra and turbulence variances over a hill.
ESDU
Surface Roughness; Turbulence; Wind Velocity; Spreadsheets; Atmospheric Boundary Layer; Numerical Analysis

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ENVIRONMENT POLLUTION

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

20020074771 Lockheed Martin Advanced Technology Center, Palo Alto, CA USA
CLAES Product Improvement by Use of the GSFC Data Assimilation System (DAS) ***Progress Report, 12 May - 21 Dec. 2000***
Kumer, J. B., Lockheed Martin Advanced Technology Center, USA; Jan. 04, 2000; 19p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS5-98046
Report No.(s): LMSS/GK01-004; Rept-6; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the Cryogenic Limb Array Etalon Spectrometer (CLAES) product improvement by use of the GSFC Data Assimilation System (DAS). The first task is to plug line of sight gradients derived from the CTM for 2/20/92 into the forward model of our retrieval software (RSW) in order to assess the impact on the retrieved quantities. The reporting period covers 12 May 2000 - 21 December 2000.
CASI
Cryogenics; Etalons; Spectrometers; Data Acquisition; Atmospheric Chemistry

20020074900 Wyle Labs., Inc., Arlington, VA USA
Assessment of the Subsonic Noise Environment in the Nellis Range Complex ***Interim Report, Jun. 1991-Jan. 1993***
Frampton, Kenneth D.; Lucas, Michael J.; Plotkin, Kenneth J.; Jan. 1993; 80p; In English
Contract(s)/Grant(s): Proj-7757
Report No.(s): AD-A405069; WR93-3; AFRL-HE-WP-TR-2002-0021; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Nellis AFB Range covers over 13,000 square miles of southern Nevada. Numerous US Air Force aircraft operate within this range on a regular basis, participating in various forms of combat-readiness training. It is the purpose of this report to quantify the noise levels associated with subsonic operations and to evaluate the resulting environmental consequences. Nellis Range noise level predictions were accomplished using current US Air Force ROUTEMAP and NOISEMAP technology in conjunction with Nellis AFB operations information. The operations information was analyzed and reduced to reflect the operating conditions within the Nellis AFB Range. This information was then joined with ROUTEMAP and NOISEMAP computer models to calculate the noise environment. A total of four operating scenarios were analyzed for this report and then scaled for the busiest month of 1992. The noise levels for the Nellis Range Complex are presented in the form of composite contours. In the case of the three Military Training Routes (MTRs), the noise levels for various lateral distances from the MTR centerline are reported. It was found that, in all airspaces, the Day/Night Average Sound Levels were within normally acceptable land-use compatibility guidelines.
DTIC
Computerized Simulation; Military Aircraft; Aircraft Noise; Technology Utilization

20020075741 Geological Survey, Water Resources Div., Reston, VA USA
Contaminants and Drinking-Water Sources in 2001: Recent Findings of the US Geological Survey
Patterson, G. G.; Focazio, M. J.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-108867; USGS/OFR-00-510; No Copyright; Avail: National Technical Information Service (NTIS)

As the Nation’s principal earth-science agency, the U.S. Geological Survey (USGS) studies numerous issues related to contamination of drinking-water sources. The work includes monitoring to determine the spatial and temporal distribution of contaminants; research to determine sources, transport, transformations, and fate of contaminants, and assessments of vulnerability. Much of the work is conducted in cooperation with the U.S. Environmental Protection Agency and other Federal, State, Tribal, and local governments, to help provide a scientific basis for resource management and regulation. Examples of recent results are presented for two broad categories of drinking-water projects: occurrence studies, and source-water assessments.
NTIS
Contaminants; Geological Surveys; Environments; Fresh Water

20020076004 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Assessing multizone airflow software
Lorenzetti, D. M.; Dec. 01, 2001; 18p; In English
Report No.(s): DE2001-795952; LBNL--47653; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Multizone models form the basis of most computer simulations of airflow and pollutant transport in buildings. In order to promote computational efficiency, some multizone simulation programs, such as COMIS and CONTAM, restrict the form that their flow models may take. While these tools allow scientists and engineers to explore a wide range of building airflow problems, increasingly their use has led to new questions not answerable by the current generation of programs. This paper, directed at software developers working on the next generation of building airflow models, identifies structural aspects of COMIS and related programs that prevent them from easily incorporating desirable new airflow models. The paper also suggests criteria for evaluating alternate simulation environments for future modeling efforts.

NTIS
Air Flow; Contaminants; Pollution Transport; Fluid Flow

20020076089 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Assessing Multizone Airflow Software
Lorenzetti, D. M.; Dec. 2001; 22p; In English
Report No.(s): DE2002-795952; LBNL-47653; No Copyright; Avail: National Technical Information Service (NTIS)

Multizone models form the basis of most computer simulations of airflow and pollutant transport in buildings. In order to promote computational efficiency, some multizone simulation programs, such as COMIS and CONTAM, restrict the form that their flow models may take. While these tools allow scientists and engineers to explore a wide range of building airflow problems, increasingly their use has led to new questions not answerable by the current generation of programs. This paper, directed at software developers working on the next generation of building airflow models, identifies structural aspects of COMIS and related programs that prevent them from easily incorporating desirable new airflow models. The paper also suggests criteria for evaluating alternate simulation environments for future modeling efforts.

NTIS
Air Flow; Computerized Simulation; Software Engineering; Pollution Transport; Mathematical Models

20020076090 Idaho National Engineering and Environmental Lab., Idaho Falls, ID USA
Supercritical Fluid Extraction of Plutonium and Americium from Soil
Fox, R. V.; Mincher, B. J.; 2002; 12p; In English
Report No.(s): DE2002-797090; No Copyright; Avail: Department of Energy Information Bridge

Supercritical fluid extraction (SFE) of plutonium and americium from soil was successfully demonstrated using supercritical fluid carbon dioxide solvent augmented with organophosphorus and beta-diketone complexants. Spiked Idaho soils were chemically and radiologically characterized, then extracted with supercritical fluid carbon dioxide at 2,900 psi and 65 deg C containing varying concentrations of tributyl phosphate (TBP) and thenoyltrifluoroacetone (TTA). A single 45 minute SFE with 2.7 mol% TBP and 3.2mol% TTA provided as much as 88% plus or minus 6.0 extraction of americium and 69% plus or minus 5.0 extraction of plutonium. Use of 5.3 mol% TBP with 6.8 mol% of the more acidic beta-diketone hexafluoroacetylacetone (HFA) provided 95% plus or minus 3.0 extraction of americium and 83% plus or minus 5.0 extraction of plutonium in a single 45 minute SFE at 3,750 psi and 95 deg C. Sequential chemical extraction techniques were used to chemically characterize soil partitioning of plutonium and americium in pre-SFE soil samples. Sequential chemical extraction techniques demonstrated that spiked plutonium resides primarily (76.6%) in the sesquioxide fraction with minor amounts being absorbed by the oxidizable fraction (10.6%) and residual fractions (12.8%). Post-SFE soils subjected to sequential chemical extraction characterization demonstrated that 97% of the oxidizable, 78% of the sesquioxide and 80% of the residual plutonium could be removed using SFE. These preliminary results show that SFE may be an effective solvent extraction technique for removal of actinide contaminants from soil.

NTIS
Americium; Metal Oxides; Plutonium; Soil Sampling; Supercritical Fluids

20020076160 Science and Engineering Services, Inc., Burtonsville, MD USA
Monitoring Earth's Atmosphere
Spinoff 1997; 1997, pp. 94; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Originally developed by Goddard Space Flight Center, the Micro Pulse Lidar (MPL) System is now available commercially from Science and Engineering Services, Inc through a technology transfer license. The MPL System is built to characterize numerous details of the composition and dynamics of the atmosphere, such as atmospheric cloud and aerosol concentration and is suitable for environmental monitoring studies that require full-time, unattended measurements of cloud and aerosol height structure. It is eye safe at all ranges and because of the modest dimensions, can be used where space is limited. The system can also be equipped with a protective climate-controlled enclosure, permitting placement of the system in field operations where adequate shelter may not exist. Studies of climate dynamics, meteorological research, and environmental monitoring are a few of the possible applications.
Author
Atmospheric Composition; Aerosols; Cloud Height Indicators; Fabrication; Optical Radar

20020076165 Geological Survey, Water Resources Div., Hartford, CT USA
Plan for Assessing the Occurrence and Distribution of Methyl tert-Butyl Ether and Other Volatile Organic Compounds in Drinking Water and Ambient Ground Water in the Northeast and Mid-Atlantic Regions of the USA
Grady, S. J.; Casey, G. D.; 1999; 46p; In English
Report No.(s): PB2002-108939; USGS-OFR-99-207; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
A plan to assess the occurrence and distribution of methyl tert-butyl ether (MTBE) and other volatile organic compounds (VOCs) in drinking water and ambient ground water in the Northeast and Mid-Atlantic regions of the United States was designed to meet two primary objectives. This study will provide the U.S. Environmental Protection Agency with information on potential human exposure to MTBE and other VOCs from drinking water. In addition, the study will further the goals of the U.S. Geological Survey's (USGS) National Water Quality Assessment Program (NAWQA) by providing additional information on the occurrence and distribution of VOCs in ambient ground water beneath a large, highly urbanized part of the Nation. The study will proceed in two phases-a drinking-water assessment (phase 1) and an ambient ground-water assessment (phase 2). The drinking-water assessment will involve compilation, review, and analysis of available water quality and ancillary data for approximately 20 percent of the community water systems in 12 States in the Northeast and Mid-Atlantic regions. This effort will summarize the occurrence and distribution of MTBE and other VOCs in drinking water supplied by 2,110 community water systems. The ambient ground-water assessment will involve compilation, review, and analysis of data on MTBE and other VOCs from previous USGS studies in the 12-State area, including regional water-quality assessments conducted for the USGS's NAWQA, plus other available State or local datasets. These data will be related, to the extent allowed by the completeness and quality of the data, to land-use patterns, population density, and other anthropogenic and natural factors using statistical tests.
NTIS
Geological Surveys; Ground Water; Methyl Compounds; Potable Water; Volatile Organic Compounds; Benzene

20020076167 National Oceanic and Atmospheric Administration, Air Resources Lab., Silver Spring, MD USA
Description of the HYSPLIT-4 Modeling System
Draxler, R. R.; Hess, G. D.; Aug. 1998; 32p; In English
Report No.(s): PB2002-108918; NOAA/TM/ERL/ARL-224; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The HYSPLIT-4 (HYbrid Single-Particle Lagrangian Integrated Trajectory) model (Version 4) is a complete system for computing simple trajectories to complex dispersion and deposition simulations using either puff or particle approaches. The model uses previously gridded meteorological data on one of three conformal map projections (Polar, Lambert, Mercator). Air concentration calculations associate the mass of the pollutant species with the release of either puffs, particles, or a combination of both. The dispersion rate is calculated from the vertical diffusivity profile, wind shear, and horizontal deformation of the wind field. Air concentrations are calculated at a specific grid point for puffs and as cell-average concentrations for particles.
NTIS
Mathematical Models; Atmospheric Diffusion; Air Pollution; Lagrangian Function; Particle Trajectories

20020076179 State Univ. of New York, Research Foundation, Albany, NY USA
Final Technical Report on Atmospheric Ozone as a Climate Gas
Wang, W. C.; Feb. 04, 2002; 5p; In English
Report No.(s): DE2001-792078; DOEER62588-3; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This report summarizes the major research accomplishments of the project 'Atmospheric Ozone as a Climate Gas' for the period Apri1 1, 1998-September 30, 2001. The objectives of the project were: (1) to investigate the physical, chemical and dynamical processes that affect mid-latitude O3 in the lower stratosphere and free troposphere; and (2) to study climate-chemistry

interaction concerning O3 changes in these regions and their influence on (and response to) future climate change due to increasing greenhouse gases CO2, N2O, CH4 and the CFCs, and changes of O3 precursor gases.
NTIS
Ozone; Climate Change; Chlorofluorocarbons; Atmospheric Chemistry; Gas Composition

20020076180 Pacific Northwest National Lab., Richland, WA USA
Assessment of Unabated Facility Emission Potentials for Evaluating Airborne Radionuclide Monitoring Requirements at Pacific Northwest National Laboratory - 2001
Ballinger, M. Y.; Sula, M. J.; Gervais, T. L.; Shields, K. D.; Edwards, D. R.; Sep. 28, 2001; 60p; In English
Report No.(s): DE2001-789923; PNNL-10855R2; EW02J1SS1; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Assessments were performed to evaluate compliance with the airborne radionuclide emission monitoring requirements in the National Emission Standards for Hazardous Air Pollutants (NESHAP - U.S. Code of Federal Regulations, Title 40 Part 61, Subpart H) and Washington Administrative Code (WAC) 246-247: Radiation Protection - Air Emissions. In these assessments, potential unabated offsite doses were evaluated for emission locations at facilities owned by the U.S. Department of Energy and operated by Pacific Northwest National Laboratory (PNNL) on the Hanford Site. This report describes the inventory-based methods, and provides the results, for the assessment performed in 2001.
NTIS
Exhaust Emission; Radioactive Isotopes; Pollution Control; Air Pollution

20020076194 Geological Survey, Water Resources Div., Reston, VA USA
Nonpoint and Point Sources of Nitrogen in Major Watersheds of the USA ***Final Report***
Puckett, L. J.; 1994; 16p
Report No.(s): PB2002-108943; USGS-WRI-94-4001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Estimates of nonpoint and point sources of nitrogen were made for 107 watersheds located in the U.S. Geological Survey's National Water- Quality Assessment Program study units throughout the conterminous USA. The proportions of nitrogen originating from fertilizer, manure, atmospheric deposition, sewage, and industrial sources were found to vary with climate, hydrologic conditions, land use, population, and physiography. Fertilizer sources of nitrogen are proportionally greater in agricultural areas of the West and the Midwest than in other parts of the Nation. Animal manure contributes large proportions of nitrogen in the South and parts of the Northeast. Atmospheric deposition of nitrogen is generally greatest in areas of greatest precipitation, such as the Northeast. Point sources (sewage and industrial) generally are predominant in watersheds near cities, where they may account for large proportions of the nitrogen in streams.
NTIS
Nitrogen; Watersheds; Water Pollution

20020076195 Geological Survey, Water Resources Div., Denver, CO USA
Review of Phosphorus Control Measures in the USA and Their Effects on Water Quality
Litke, D. W.; 1999; In English
Report No.(s): PB2002-108942; USGS/WRI-99-4007; No Copyright; Avail: CASI; C01, CD-ROM

Historical information on phosphorus loadings to the environment and the effect on water quality are summarized in this report, which was produced as part of the U.S. Geological Survey's National Water-Quality Assessment (NAWQA) Program. Phosphorus is a water-quality constituent of concern because it is often the limiting nutrient responsible for accelerated eutrophication in water bodies.
NTIS
Phosphorus; Water Quality; Pollution Monitoring; Water Pollution

20020076197 Environmental Protection Agency, Office of Water, Washington, DC USA
Options for the Office of Ground Water and Drinking Water Information Strategy (Working Draft)
Feb. 2001; 70p
Report No.(s): PB2002-108960; EPA/816-P-01-001; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Information is critical to the management of major national programs and shapes responses to rapidly changing events in the public health arena. The Office of Ground Water and Drinking Water must bring its information management into strategic alignment with the needs of both its internal and external stakeholders to maintain credibility in a data-driven environment. Information management in the private sector provides examples of reduced costs and improved decision support systems using

current technology that can be applied in the public sector. This Office of Ground Water and Drinking Water (OGWDW) Information Strategy is a first step in revising its Information Strategic Plan (ISP) to focus on essential data, reporting and analyses supporting decisions of the national ground water and drinking water programs to protect public health. The objective of the OGWDW Information Strategy is to identify a range of actions in the near term to modernize its information systems and to define achievable direction in the intermediate and longer terms that recognize evolving information needs and technology, and effective and efficient information management to support public health protection.
NTIS
Information Management; Ground Water; Potable Water

20020076198 Geological Survey, Water Resources Div., Indianapolis, IN USA
Variability of Pesticide Detections and Concentrations in Field Replicate Water Samples Collected for the National Water-Quality Assessment Program, 1992-97
2001; 94p
Report No.(s): PB2002-109012; USGS/WRI-01/4178; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
Field replicate water samples ('field Replicates') collected for the U.S. Geological Survey National Water-Quality Assessment (NAWQA) Program during 1992 to 1997 were used to assess the variability of pesticide detections and concentrations in environmental water samples collected from the surface and ground-water-quality networks of the NAWQA Program. Field replicates are two or more identically collected, processed, and analyzed environmental water samples that are used to assess the overall variability of field and laboratory procedures. Variability is the degree of random error in independent measurements of the same quantity and is the opposite of precision-the degree of mutual agreement. Information on variability can be used to estimate the reproducibility of individual measurements, the concentration needed to be assured of exceeding a water-quality standard, and the likelihood that two measurements of water quality are different.
NTIS
Water Quality; Pesticides; Concentration (Composition)

20020076200 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA
Latest Findings on National Air Quality: 2001 Status and Trends
Sep. 2002; In English
Report No.(s): PB2002-109065; EPA/454/K-02/001; No Copyright; Avail: CASI; C01, CD-ROM
This summary report highlights the U.S. Environmental Protection Agency's (EPA's) most recent evaluation of status and trends in our nation's air quality. Overall, national air quality levels measured at thousands of monitoring stations across the country have shown improvement over the past 20 years for all six principal pollutants.
NTIS
Air Quality; Pollution Monitoring

20020076208 Geological Survey, Water Resources Div., Reston, VA USA
Design of a National Survey of Methyl tert-Butyl Ether and Other Volatile Organic Compounds in Drinking-Water Sources
Ivahnenko, T.; Grady, S. J.; Delzer, G. C.; 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-108938; USGS-OFR-01-271; No Copyright; Avail: National Technical Information Service (NTIS)
The U.S. Geological Survey (USGS), in collaboration with the Metropolitan Water District of Southern California (MWDSC) and the Oregon Graduate Institute of Science and Technology (OGI) in Beaverton, Oregon, is designing a survey of the frequency of detection, concentration, and distribution of methyl tert-butyl ether (MTBE), other ether gasoline oxygenates, their degradation products, and other volatile organic compounds (VOCs) in source water used by community water systems (CWSs) in the USA. This national survey is sponsored by the American Water Works Association Research Foundation. The survey will be accomplished in two stages. The first stage, termed the Random Source-Water Survey, will determine the frequency of detection and the range in concentrations of MTBE, three other ether gasoline oxygenates, and 62 other VOCs in drinking-water sources through a statistically stratified design for sampling CWSs by the total number of systems within five population served-size categories, source of water (ground or surface water), and the total number of people served by each of the source-size categories presently used within the USA. A total of 1,000 CWSs that will represent the more than 54,000 CWSs from all 50 States, Native American Lands, and Puerto Rico will be sampled. The 1,000 source-water samples will be distributed to allocate 613 samples

to ground-water-supplied CWSs (wells, springs, and galleries) and the remaining 387 samples to surface-water-supplied CWSs (rivers, aqueducts, canals, lakes, and reservoirs).
NTIS
Geological Surveys; Methyl Compounds; Surveys; Volatile Organic Compounds; Water Pollution

20020076211 Automated Credit Exchange, Pasadena, CA USA
Automated Pollution Control
Spinoff 1997; 1997, pp. 88; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Patterned after the Cassini Resource Exchange (CRE), Sholtz and Associates established the Automated Credit Exchange (ACE), an Internet-based concept that automates the auctioning of ”pollution credits” in Southern California. An early challenge of the Jet Propulsion Laboratory’s Cassini mission was allocating the spacecraft’s resources. to support the decision-making process, the CRE was developed. The system removes the need for the science instrument manager to know the individual instruments’ requirements for the spacecraft resources. Instead, by utilizing principles of exchange, the CRE induces the instrument teams to reveal their requirements. In doing so, they arrive at an efficient allocation of spacecraft resources by trading among themselves. A Southern California RECLAIM air pollution credit trading market has been set up using same bartering methods utilized in the Cassini mission in order to help companies keep pollution and costs down.
Author
Pollution Control; Decision Making; Automatic Control; Technology Transfer

20020076236 Faucett (Jack) Associates, Inc., Bethesda, MD USA
Emission Trading for Small Businesses ***Final Report***
Mar. 2002; 46p; In English
Report No.(s): PB2002-102232; JACKFAU-530; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In recent years, states, regional associations and the U.S. Environmental Protection Agency (EPA) have greatly increased their interest and activity regarding emission trading. Emissions trading is an economic incentive-based alternative to command-and-control regulation. In an emissions trading program, sources of a particular pollutant (most often an air pollutant) are given permits to release a specified number of tons of the pollutant. A government or trading agency issues only a limited number of permits consistent with the desired level of emissions. The owners of the permits may keep them and release the pollutants, or reduce their emissions and sell the permits. The fact that the permits have value as an item to be sold or traded gives the owner an incentive to reduce their emissions. When applied properly, emission trading is an economic incentive that can reduce the aggregate cost of meeting local or regional air quality standards, while providing less bureaucratic intrusion into the operation of individual businesses. It also provides greater flexibility in meeting production goals and emission reduction requirements. Approximately thirty emission trading programs currently exist or are being developed. Our study began with a list, developed by the Sierra Club in 1994, of twenty-nine such programs.
NTIS
Economics; Commerce; Environment Protection; Emission

20020076281 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Porz-Wahn, Germany
The Tropospheric Aerosol At Mid-Latitudes-Microphysics, Optics, and Climate Forcing Illustrated by the LACE 98 Field Study ***Das Troposphaerische Aerosol in Mittleren Breiten: Mikrophysik, Optik und Klimaantrieb am Beispiel der Feldstudie LACE 98***
Fiebig, Markus, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; 2001; ISSN 1434-8454; 264p; In German; Original contains color illustrations
Report No.(s): DLR-FB-2001-23; Copyright; Avail: Issuing Activity

This study investigates the column closure of optical aerosol parameters as part of the Lindenberg Aerosol Characterisation Experiment (LACE 98). The optical aerosol parameters were calculated from microphysical aerosol parameters which were measured height resolved from tropopause to boundary layer and compared with the direct measurement of the respective property (closure). The closure allows the validation of the measured aerosol properties and the inversion of aerosol properties which are not measurable directly. The radiative forcings of the measured aerosol columns are estimated. The measured, quality assured microphysical aerosol properties are parameterized and tabulated as input data for models. The successful closure of the aerosol columns optical depth validates the measured particle size distributions, whereas the successful closure of the backscatter coefficient validates the assumptions made on the aerosol chemical composition and serves to deduce its state of mixture, the latter point exemplified using a 7 days old forest fire aerosol. The local, instantaneous radiative forcing of the measured continental

particle columns are estimated to lie between -33 W/sq m for continental and -6 W/sq m for marine air masses for a solar zenith angle of 56 deg.
Author
Aerosols; Troposphere; Chemical Composition; Scattering Coefficients; Size Distribution; Air Masses; Boundary Layers

20020076287 NASA Goddard Space Flight Center, Greenbelt, MD USA
Monitoring of Observation Errors from Satellite Ozone Instruments in Assimilation
Stajner, Ivanka, NASA Goddard Space Flight Center, USA; Winslow, Nathan, NASA Goddard Space Flight Center, USA; Rood, Richard B., NASA Goddard Space Flight Center, USA; Pawson, Steven, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AGU Spring Meeting, 28-31 May 2002, Washington, DC, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Ozone distributions derived from the Solar Backscatter UltraViolet/2 (SBUV/2) instruments and the Earth Probe Total Ozone Mapping Spectrometer (EP TOMS) have been assimilated in near-real time at the NASA/Goddard Data Assimilation Office since January 2000. Observed-minus-forecast (O-F) residuals are the differences between the incoming ozone data and the co-located short-term model forecast. They are routinely produced and monitored in the assimilation process. Using examples from the NOAA-14 and NOAA-16 SBUV/2 and the EP-TOMS instruments, it is demonstrated that the monitoring of time series of O-F residual statistics is an effective method of identifying time-dependent changes in the observation-error characteristics of ozone. In addition, the data assimilation system was used to assist the validation of updated calibration coefficients for the NOAA-14 SBUV/2 instrument. This assimilation-based monitoring work will be extended to ozone data from instruments on new satellites: Envisat EOS, Aqua, and EOS Aura.
Author
Satellite Observation; Ozone; Data Processing; Errors

20020076294 Resources for the Future, Inc., Washington, DC USA
Ancillary Benefits and Net Costs of Climate Policies ***Final Report, 15 Sep. 1997 - 14 Sep. 01***
Dec. 14, 2001; 12p; In English
Report No.(s): DE2002-791429; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The focus of this project was on reductions in carbon dioxide that would be achieved in the electricity sector. A detailed model of the electricity sector was extended and used to simulate a variety of policies aimed at reducing GHGs. The output from this model was evaluated using an integrated assessment model to account for atmospheric transport model for secondary particulates stemming from nitrogen oxides (NOx) and sulfur dioxide (SO2) emissions. The resulting changes in atmospheric concentrations of particulates were fed into a health epidemiology model to estimate changes in health status, and these changes were valued in monetary terms using recent studies from environmental and health economics.
NTIS
Carbon Dioxide; Climate Change; Atmospheric Composition; Climate

20020076298 NASA Goddard Space Flight Center, Greenbelt, MD USA
The Influence of Planetary Wave Transport on Arctic Ozone as Observed by POAM III
Strahan, Susan, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; Spring AGU Meeting, 28-31 May 2002, Washington, DC, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Three recent Arctic winters have been unusually warm or cold compared to the 1979-2001 mean, resulting in either a warm, disturbed vortex or a cold, quiet vortex. Interannual differences n ozone transport in the lower stratospheric Arctic vortex are investigated using data from the Polar Ozone and Aerosol Measurement (POAM) III satellite instrument obtained between May 1998 and April 2001. Time series of probability distribution functions (PDFs) of the FOAM data are used to identify seasonal and interannual variations in the transport processes controlling polar ozone. A major warming occurred in December, 1998, that caused the middle stratospheric vortex to be displaced from the pole for nearly a month and dissipate. Ozone transport is inferred from the PDFs and supported by potential vorticity (PV) analyses. The vortex reformed in January, 1999, filled with high O3 air from lower latitudes, which then cooled and descended. As a result, by the end of winter 1999, ozone at 500K in the vortex was 0.5-1.0 ppm higher than in the cold winter of 2000. The winter of 2000-1 had frequent wave disturbances, beginning with a fairly large event in November. However, at the end of this wave activity, the high PV core of the vortex was still intact, and by February, 03 in the vortex looked the same as in 2000. This study demonstrates that interannual variability in the 03-PV relationship can

be caused by transport, independent of 03 loss by polar stratospheric clouds (PSCs). Ozone in the vortex in a very disturbed winter does not necessarily represent'pre-PSC' O3 levels in other years.
Author
Annual Variations; Ozone; Ozone Depletion; Arctic Regions; Satellite Observation; Planetary Waves

20020076303 NASA Goddard Space Flight Center, Greenbelt, MD USA
Sensitivity of Lower Stratospheric Assimilated Ozone on Error Covariance Modeling and Data Selection
Stajner, Ivanka, NASA Goddard Space Flight Center, USA; Rood, Richard B., NASA Goddard Space Flight Center, USA; Winslow, Nathan, NASA Goddard Space Flight Center, USA; Wargan, Krzysztof, NASA Goddard Space Flight Center, USA; Pawson, Steven, NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AGU Spring Meeting 2002, 28-31 May 2002, Washington, DC, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Assimilated ozone is produced at the NASA/Goddard Data Assimilation Office by blending ozone retrieved from the Solar Backscatter UltraViolet/2 (SBUV/2) instrument and the Earth Probe Total Ozone Mapping Spectrometer (EP TOMS) measurements into an off-line transport model. The current system tends to overestimate the amount of lower stratospheric ozone. This is a region where ozone plays a key role in the forcing of climate. A biased ozone field in this region will adversely impact calculations of the stratosphere-troposphere exchange and, when used as a first guess in retrievals, the values determined from satellite observations. Since these are all important applications of assimilated ozone products, effort is being directed towards reducing this bias. The SBUV ozone data have a coarse vertical resolution with increased uncertainty below the ozone maximum, and TOMS provides only total ozone columns. Thus, the assimilated ozone in the lower stratosphere, and its vertical distribution in particular, are only weakly constrained by the incoming SBUV and TOMS data. Consequently, the assimilated ozone distribution should be sensitive to changes in inputs to the statistical analysis scheme. Accordingly, the sensitivity of the assimilated lower stratospheric ozone fields to changes in the TOMS error-covariance modeling and the SBUV data selection has been investigated. The use of a spatially correlated TOMS error covariance model led to improvements in the product. However, withholding the SBUV/2 data for the layer between 63 and 126 hPa typically degraded the product, a result which vindicates the use of this layer ozone product, despite its known errors. These efforts to improve the lower stratospheric distribution will be extended to include a more advanced forecast error covariance model, and by assimilating ozone products from new instruments on Envisat and EOS Aura.
Author
Error Analysis; Satellite Observation; Ozone; Data Integration; Atmospheric Models

20020076318 Transportoekonomisk Inst., Oslo Norway
Towards a National Indicator for Noise Exposure and Annoyance. Part 2: Mapping Changes in Noise Annoyance to Monitor the Efficacy of Noise Reduction Effort
Klaeboe, R.; Bjomskau, T.; Dec. 2000; 38p; In English
Report No.(s): PB2002-105083; RR-1173/2000; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This paper describes a system for connecting the noise exposure mapping proposed by Statistics Norway to socio-acoustic studies in a set of 40+ study areas that are representative for Norwegian noise neighborhoods. Work in order to establish measurement instruments for factors that may significantly modify the relationships between exposure and annoyance are also described. The end result of the modeling effort is a mapping of changes in noise annoyance that is representative for the Norwegian population. When related to information on noise exposure and controlling for modifying factors and inter-area differences are taken into account it will be able to ascertain which noise combat techniques work and which don't. It will also be possible to decide how far the national efforts go in attaining the target of a 25% noise annoyance reduction in Norway before 2010.
NTIS
Noise (Sound); Noise Reduction; Noise Pollution; Noise Measurement

20020076329 ENVIRON International Corp., Novato, CA USA
Proximate Modeling of Weekday/Weekend Ozone Differences for Los Angeles *Final Report*
Yarwood, G.; Heiken, J.; Jul. 31, 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM and in paper copy
Report No.(s): PB2002-108498; No Copyright; Avail: National Technical Information Service (NTIS)

Emissions of nitrogen oxides (NOx) and volatile organic compounds (VOC) from both man-made and natural sources react in the presence of sunlight to form ground-level ozone. In the Los Angeles basin (LA basin), ozone levels now tend to reach higher peak levels on weekends than weekdays. The systematic difference between weekend and weekday ozone is referred to as the

'weekend effect.' The objective of this study was to test weekend effect hypotheses in a photochemical grid model for Los Angeles. In some cases, full descriptions of the emissions changes hypothesized to cause the weekend effect are not yet available, and so the term 'proximate modeling' is used to describe experiments that are based on the best available approximation to the emission changes. The goal is to rigorously and quantitatively test hypotheses in a full-scale 3-D air quality model for Los Angeles of the type that is used to develop ozone attainment strategies.
NTIS
Ozone; Air Pollution; California; Atmospheric Models

20020076343 Environmental Protection Agency, National Risk Management Research Lab., Research Triangle Park, NC USA
Environmental Technology Verification: Credible Performance Data for Technology Users
Brna, T. G.; May 13, 2002; 26p
Report No.(s): PB2002-107520; EPA/600/A-02/073; NRMRL-RTP-P-670; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Environmental Technology Verification (ETV) Program has begun by the U.S. Environmental Protection Agency in 1995 to accelerate the commercialization of innovative or improved environmental technologies through third-party verification of their performance. During its pilot period, 1995-2000, up to 12 pilot programs operated in the market-based verification process involving nonprofit private/public partnerships. The ETV Program is a voluntary (nonregulatory) program which is restricted to commercially ready technologies and uses credible independent testing organizations to execute peer-reviewed test/quality assurance plans. Accomplishments of the ETV Program are summarized and lesson learned during the pilot period are discussed. Restructuring of the pilot programs into six centers began in late 2000 and is noted briefly. Discussed in detail is the Air Pollution Control Technology Verification Center, including its organization, operational features, technology areas of interest, and verifications performed.
NTIS
Environment Protection; Technology Assessment; Air Pollution

20020076344 Environmental Protection Agency, Washington, DC USA
Example Application of Modeling Toxic Air Pollutants in Urban Areas (Revised)
Jun. 2002; 116p; In English
Report No.(s): PB2002-108218; EPA/454/R-02/003; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Emissions for the Houston region were processed through EMS-HAP and annual average concentrations were calculated using the ISCST3 model. Emissions were processed with two methods: (1) all sources were modeled as 1 km grid cells, and (2) onroad mobile emissions were allocated to road segments. In method two, onroad mobile emissions not specifically allocated to road segments were modeled to 1 km grid cells. Other sources (major, area/other, and nonroad mobile) were modeled as in method one. After emission processing by EMS-HAP, sources were divided into rural and urban sources. ISCST3 was then run for each source type and concentrations added together at each receptor during postprocessing. ISCST3 was run for five pollutants: benzene, cadmium, chromium, formaldehyde, and lead. There were 711 receptors used in the model (700 census tract centroids and 11 monitors). For benzene and formaldehyde, ISCST3 was also run using the road segment emissions. Additionally, for benzene, ISCST3 was run in an area of high major/onroad emissions with receptors every 500m.
NTIS
Air Pollution; Cities; Pollution Monitoring; Contaminants

20020076347 Research Triangle Inst., Center for Economics Research, Research Triangle Park, NC USA
Economic Analysis of Air Pollution Regulations: Miscellaneous Organic Chemicals (MON) ***Final Report***
Heller, K. B.; Depro, B. M.; Perry, V. A.; Mar. 2002; 250p; In English
Report No.(s): PB2002-108970; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The U.S. Environmental Protection Agency (EPA) is developing a maximum achievable control technology (MACT) standard to reduce hazardous air pollutants (HAPs) from the coatings manufacturing and chemical manufacturing source categories. EPA estimates that 370 facilities produce miscellaneous organic NESHAP (MON) products, including 207 that produce MON organic chemicals using batch processes, 140 that produce MON chemicals using continuous processes, and 127 that produce MON coatings. of the 370 facilities, 64 use both batch and continuous processes to produce organic chemicals; 15 produce both coatings and continuousprocess MON chemicals; 12 produce both coatings and batch-process organic chemicals; and two produce coatings, batch-process chemicals, and continuous-process chemicals. to support EPA's development of the MACT standards, hereafter referred to as the Miscellaneous Organic NESHAP or MON, EPA's Innovative Strategies and

Economic Group (ISEG) has conducted an economic impact analysis (EIA) to assess the potential costs of the rule. This report documents the methods and results of this EIA.
NTIS
Economic Impact; Protective Coatings; Pollution; Pollution Control; Air Quality

20020076371 ETS, Inc., Roanoke, VA USA
Baghouse Filtration Products Verification Testing, How it Benefits the Boiler Baghouse Operator
Mycock, J.; Turner, J.; Farmer, J.; 2002; 36p; In English
Report No.(s): PB2002-107531; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper describes the Environmental Technology Verification (ETV) Program for baghouse filtration products developed by the Air Pollution Control Technology Verification Center, one of six Centers under the ETV Program, and discusses how it benefits boiler baghouse operators. A generic protocol was developed for testing particle filtration efficiency for particles less than 2.5 micrometers in aerodynamic diameter. Total particle removal efficiency and pressure drop data are also reported. Fifteen products (both membrane and non-membrane filter media) from 10 manufacturers have been tested to date. The results are reported in verification reports and verification statements. The ETV Program was started by the U.S. Environmental Protection Agency in October 1995 to generate independent and credible data on the performance of innovative technologies that have the potential to improve protection of public health and the environment. The purpose of the program is to help organizations, industries, businesses, states, communities, and individuals make better-informed decisions when selecting new environmental technologies. Participation is voluntary. No approvals are granted. No standards are certified. No guarantees or recommendations are made. Quality data, responsive to customer need, is the product. The ETV Program's success depends on obtaining and communicating information about the performance of technologies to those who decide on the selection and implementation of environmental solutions. Forecasts indicate a big market for new and retrofit fabric filters.
NTIS
Filtration; Particulates; Air Pollution; Pollution Control; Proving; Laboratories; Air Filters

20020076373 Ricardo North America, Inc., Burr Ridge, IL USA
Literature Survey to Assess the State-of-the-Art of Selective Catalytic Reduction of Vehicle NOx Emissions
Adelman, B.; Jun. 21, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-108024; No Copyright; Avail: CASI; C01, CD-ROM

Ricardo has been commissioned by Coordinating Research Council to perform a comprehensive search of several scientific databases in order to assess the state-of-the-art of selective catalytic reduction of No-x using hydrocarbons as the reductant source. The objective is to identify potential catalyst formulations which show promise as emission control technologies to be used in LDD applications.
NTIS
Catalysts; Pollution Control; Exhaust Emission; Emission Spectra; Air Pollution

20020076374 Denver Univ., Dept. of Chemistry and Biochemistry, USA
On-Road Remote Sensing of Automobile Emissions in the Los Angeles Area: Year 3 (Riverside) ***Final Report***
Pokharel, S. S.; Bishop, G. A.; Stedman, D. H.; Jun. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only availiable on CD-ROM
Report No.(s): PB2002-108021; No Copyright; Avail: CASI; C01, CD-ROM

The University of Denver conducted the third year of a multi-year remote sensing study in the Los Angeles, CA area. The remote sensor used in this study is capable of measuring the ratios of CO, HC, and NO to CO2 in motor vehicle exhaust. From these ratios, we calculate the percent concentrations of CO, CO2, HC and NO in motor vehicle exhaust which would be observed by a tailpipe probe, corrected for water and any excess oxygen not involved in combustion. The system used in this study was also configured to determine the speed and acceleration of the vehicle, and was accompanied by a video system to record the license plate of the vehicle.
NTIS
Remote Sensing; Exhaust Emission; Motor Vehicles; Infrared Detectors; Emission Spectra

20020076378 USA Conference of Mayors, Washington, DC USA
Clean Air/Brownfields Report: The US Conference of Mayors
Dec. 2001; 60p; In English
Report No.(s): PB2002-109041; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Clean Air/Brownfields Pilot Project was initiated by the U.S. Conference of Mayors, the Economic Development Administration of the U.S. Department of Commerce and the U.S. Environmental Protection Agency to examine the potential clean air policies to impact brownfields redevelopment goals. Mayors have been at the forefront of the effort to return brownfields properties to productive activities and have cited Clean Air Act requirements as a potential impediment to the reuse of these sites. Across America, there is a consensus that brownfields redevelopment is critical to reviving and expanding local economies. Local elected officials, particularly, see tremendous opportunity to increase employment, strengthen the local tax base, and improve blighted neighborhoods through the reuse of the sites. As a result, mayors are concerned about state and federal policies that may impact efforts to redevelop brownfields.
NTIS
Pollution Control; Air Quality

20020076393 Desert Research Inst., Reno, NV USA
Cloud Condensation Nuclei in FIRE III ***Final Report, 4 Jun. 1999 - 3 Jun. 2002***
Hudson, James G., Desert Research Inst., USA; Sep. 17, 2002; 3p; In English
Contract(s)/Grant(s): NAG1-2183; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Yum and Hudson showed that the springtime Arctic aerosol is probably a result of long-range transport at high altitudes. Scavenging of particles by clouds reduces the low level concentrations by a factor of 3. This produces a vertical gradient in particle concentrations when low-level clouds are present. Concentrations are uniform with height when clouds are not present. Low-level CCN (cloud condensation nuclei) spectra are similar to those in other maritime areas as found by previous projects including FIRE 1 and ASTEX, which were also supported on earlier NASA-FIRE grants. Wylie and Hudson carried this work much further by comparing the CCN spectra observed during ACE with back trajectories of air masses and satellite photographs. This showed that cloud scavenging reduces CCN concentrations at all altitudes over the springtime Arctic, with liquid clouds being more efficient scavengers than frozen clouds. The small size of the Arctic Ocean seems to make it more susceptible to continental and thus anthropogenic aerosol influences than any of the other larger oceans.
Author
Condensation Nuclei; Drops (Liquids); Clouds (Meteorology); Aerosols

20020076423 National Energy Technology Lab., Pittsburgh, PA USA
Fast-Response Isotopic Alpha Continuous Air Monitor (CAM)
Patch, K. D.; Apr. 28, 2000; 7p; In English
Report No.(s): DE2001-795743; AR26-98FT40365--09; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The objective of this effort is to develop and test a novel Continuous Air Monitor (CAM) instrument for monitoring alpha-emitting radionuclides, using a technology that can be applied to Continuous Emission Monitoring (CEM) of thermal treatment system off gas streams. The CAM instrument will have very high alpha spectral resolution and provide real-time, on-line monitoring suitable for alerting workers of high concentrations of alpha-emitting radionuclides in the ambient air and for improved control of decontamination, dismantlement, and air emission control equipment. Base Phase I involves the design, development, and preliminary testing of a laboratory-scale instrument. Testing will initially be conducted using naturally-occurring radon progeny in ambient air. In the Optional Phase II, the Base Phase I instrument will be critically evaluated at the Lovelace Respiratory Research Institute (LRRI) with characterized plutonium aerosols; then an improved instrument will be built and field-tested at a suitable DOE site.
NTIS
Pollution Monitoring; Radiation; Alpha Particles; Radiation Measuring Instruments

20020076424 National Energy Technology Lab., Pittsburgh, PA USA
Landfill operation for carbon sequestration and maximum methane emission control
Augenstein, D.; Yazdani, R.; Moore, R.; Byars, M.; Kieffer, J.; Feb. 26, 2000; 94p; In English
Report No.(s): DE2001-795745; AC26-98FT40422--04; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Controlled landfilling is an approach to manage solid waste landfills, so as to rapidly complete methane generation, while maximizing gas capture and minimizing the usual emissions of methane to the atmosphere. With controlled landfilling, methane generation is accelerated to more rapid and earlier completion to full potential by improving conditions (principally moisture, but also temperature) to optimize biological processes occurring within the landfill. Gas is contained through use of surface membrane cover. Gas is captured via porous layers, under the cover, operated at slight vacuum. A field demonstration project has been ongoing under NETL sponsorship for the past several years near Davis, CA. Results have been extremely encouraging. Two major benefits of the technology are reduction of landfill methane emissions to minuscule levels, and the recovery of greater amounts of landfill methane energy in much shorter times, more predictably, than with conventional landfill practice. With the large amount of US landfill methane generated, and greenhouse potency of methane, better landfill methane control can play a substantial role both in reduction of US greenhouse gas emissions and in US renewable energy. The work described in this report, to demonstrate and advance this technology, has used two demonstration-scale cells of size (8000 metric tons (tonnes)), sufficient to replicate many heat and compaction characteristics of larger 'full-scale' landfills. An enhanced demonstration cell has received moisture supplementation to field capacity. This is the maximum moisture waste can hold while still limiting liquid drainage rate to minimal and safely manageable levels. The enhanced landfill module was compared to a parallel control landfill module receiving no moisture additions. Gas recovery has continued for a period of over 4 years. It is quite encouraging that the enhanced cell methane recovery has been close to 10-fold that experienced with conventional landfills. This is the highest methane recovery rate per unit waste, and thus progress toward stabilization, documented anywhere for such a large waste mass. This high recovery rate is attributed to moisture, and elevated temperature attained inexpensively during startup. Economic analyses performed under Phase I of this NETL contract indicate 'greenhouse cost effectiveness' to be excellent. Other benefits include substantial waste volume loss (over 30%) which translates to extended landfill life. Other environmental benefits include rapidly improved quality and stabilization (lowered pollutant levels) in liquid leachate which drains from the waste.
NTIS
Methane; Landfills; Solid Wastes; Membrane Structures

46
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.

20020074589 Communications Research Lab., Japan
Artificial Star Generation by Stratospheric Rayleigh Scattering
Yoshikado, Shin, Communications Research Lab., Japan; Oya, Shin, Communications Research Lab., Japan; Li, Shuwing, Communications Research Lab., Japan; Aruga, Tadashi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 57-65; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

The first domestic experiment of artificial star generation by stratospheric Rayleigh scattering was conducted successfully The artificial star generation system utilizes a 1.5 m-diameter telescope of CRL for transmitting a laser beam to illuminate the atmosphere and for receiving back-scattered light. The light source of transmission used is the second harmonics of a pulse-oscillating Nd:YAG laser. Images of back-scattered light from various distances (altitudes) acquired in this experiment are analyzed from the viewpoint of their structures of image intensity distribution. Results of the analyses show that images of backscattered light from distances over about 12 km have characteristic structures due to speckles similar to those of Polaris as a reference, and proved to be applicable as artificial stars.
Author
Backscattering; Laser Beams; Light Sources; Pulsed Lasers; Rayleigh Scattering; Transmission

20020074669 Manchester Univ., Dept. of Earth Sciences, UK
North West Africa 773 (NWA773): Ar-Ar Studies of Breccia and Cumulate Lithologies
Fernandes, V. A., Manchester Univ., UK; Burgess, R., Manchester Univ., UK; Turner, G., Manchester Univ., UK; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 16; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Lunar meteorites may provide a more varied and less biased selection of lunar material. At present there are relatively few detailed age data available for the 26 lunar meteorites that have so far been discovered. As part of a wider study of Ar-Ar age determinations of lunar meteorites, we present data for North West Africa 773 (NWA773) a 633g lunar meteorite found in the

Dchira, Western Sahara in 2000. It was initially defined as a regolith breccia with a cumulate olivine gabbro, however more recently described it has having two distinct lithologies: a VLT basaltic composition and clastic components; and a Mg-rich, olivine-rich cumulate clast lithology with trace-elements and signature similar to KREEP.
Author
Meteorites; Near Earth Objects; Lithology

20020074694 Australian National Univ., Research School of Earth Sciences, Canberra, Australia
Siderophile Elements in Lunar Impact Melts: Implications for the Cataclysm, Impactor Sources, and Early Earth Environments
Norman, M. D., Australian National Univ., Australia; Bennett, V. C., Australian National Univ., Australia; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 41; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Siderophile element compositions of lunar impact melt breccias provide a primary record of the cratering history and types of impactors present in the early Solar System. In contrast to the wet and geologically active Earth, ancient impact basins on the Moon have not been reworked by weathering or tectonic events. Lunar impact breccias are, therefore, keystones for understanding such issues as the role of large meteorite impacts in the geologic evolution of terrestrial planets, and the environment in which biology and crustal structure originated on the Earth. to improve our understanding of impact histories on the early Earth and Moon, we have studied the geochemistry of Apollo 17 poikilitic breccias which are thought to represent melt ejecta from the 3.89 Ga Serenitatis basin. Following an approach pioneered by Anders and colleagues, highly siderophile element patterns (Re, Ir, Pt, Pd, Ru) were used to image the type of impactor involved in the collision.
Author
Lunar Maria; Lunar Rocks; Impact Melts; Solar System Evolution; Geochemistry; Primitive Earth Atmosphere; Meteorite Collisions

20020074715 Tennessee Univ., Planetary Geosciences Inst., Knoxville, TN USA
Origin of Nanophase Fe(sup 0) in Agglutinates: A Radical New Concept
Taylor, Lawrence A., Tennessee Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 60; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

It has become accepted lore that the myriad of grains of nanophase Fe(sup 0) (abbrev. npFe(sup 0) in lunar agglutinates are the result of 'auto-reduction of impact-melted lunar soil in the presence of solar-wind hydrogen'. However, recent studies have demonstrated other sources of npFe (sup 0) in lunar soils, as present in thin patinas (approximately 0.1 mm) on the surfaces of most soil particles. The major portion of this npFe(sup 0) formed by deposition of vapor produced by abundant micrometeorite impacts, as documented by the presence of multiple and overlapping patinas. It would appear that the presence of npFe(sup 0) in the vapor-deposited patinas (rims) on virtually all grains of a mature soil provides an additional and abundant source for the greatly increased I2/FeO values observed as grain size decreases, with some of these results having been predicted.
Author
Grain Size; Lunar Soil; Vapor Deposition; Lunar Surface

20020074723 Nishimatsu Construction Co. Ltd., Tokyo, Japan
Effects of Rock Coating on Reflectance Spectra of Rock Samples
Akiyama, H., Nishimatsu Construction Co. Ltd., Japan; Sasaki, S., Tokyo Univ., Japan; Solar System Remote Sensing; 2002, pp. 1-2; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Optical theory of 'rock coating (dust film type)' is important, because rock surface on planetary bodies is frequently covered with another materials such as dust and regolith. Rock coating is defined as the state that the surface of the rock is covered by material of differing optical properties. Hapke applied a two-layer model to the rock coating. However, validity of the two-layer model has not been discussed enough. Hapke compared measured values with his theoretical values only at a specific wavelength (750nm). There is no guarantee that measured value agrees well with the theoretical value in other wavelengths. We tried a different method to match the measured value for wide range of wavelength. The 'adding method' is used in the studies of vegetation canopy and of solar emission. In this method, multiple scattering between coating layer and rock surface is calculated and reflectance of coated rock surface is estimated. We here applied the adding method to the rock coating.
Author
Spectral Reflectance; Planetary Geology; Planetary Surfaces; Layers; Models

20020074784 NASA Ames Research Center, Moffett Field, CA USA

North Atlantic Aerosol Properties and Direct Radiative Effects: Key Results from TARFOX and ACE-2

Russell, P. B., NASA Ames Research Center, USA; Livingston, J. M., SRI International Corp., USA; Schmid, B., Bay Area Environmental Research Inst., USA; Bergstrom, R. A., Bay Area Environmental Research Inst., USA; Hignett, P., Meteorological Research Flight, UK; Hobbs, P. V., Washington Univ., USA; Durkee, P. A., Naval Postgraduate School, USA; [1998]; 4p; In English

Contract(s)/Grant(s): RTOP 622-44-10-10; RTOP 146-10-04-50-40; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Aerosol effects on atmospheric radiative fluxes provide a forcing function that can change the climate in potentially significant ways. This aerosol radiative Forcing is a major source of uncertainty in understanding the observed climate change of the past century and in predicting, future climate. To help reduce this uncertainty, the International Global Atmospheric Chemistry Project (IGAC) has endorsed a series of multiplatform aerosol field campaigns. The Tropospheric Aerosol Radiative Forcing Observational Experiment (TARFOX) and the second Aerosol Characterization Experiment (ACE-2) were the first IGAC campaigns to address the impact of anthropogenic aerosols. Both TARFOX and ACE-2 gathered extensive data sets on aerosol properties and radiative effects. TARFOX focused on the urban-industrial haze plume flowing from the eastern United States over the western Atlantic Ocean, whereas ACE-2 studied aerosols carried over the eastern Atlantic from both European urban/industrial and African mineral sources. These aerosols often have a marked influence on the top-of-atmosphere radiances measured by satellites, as illustrated in Figure 1. Shown there are contours of aerosol optical depth derived from radiances measured by the AVHRR sensor on the NOAA-11 satellite. The contours readily show that aerosols originating in North America, Europe, and Africa impact the radiative properties of air over the North Atlantic. However, the accurate derivation of flux chances, or radiative forcing, from the satellite-measured radiances or 'etrieved optical depths remains a difficult challenge. In this paper we summarize key Initial results from TARFOX and, to a lesser extent ACE-2, with a focus on those results that allow an improved assessment of the flux changes caused by North Atlantic aerosols at middle and high latitudes.

Author

Aerosols; Radiance; Atmospheric Chemistry; Atmospheric Composition; Climate Change; Polar Regions

20020074875 Michigan Univ., Dept. of Atmospheric, Oceanic, and Space Science, Ann Arbor, MI USA

Tropospheric Trace Gas Interactions with Aerosols ***Final Report, Apr. 1998 - 1999***

Penner, Joyce E., Michigan Univ., USA; [2002]; 3p; In English

Contract(s)/Grant(s): NAG1-2042; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Tropospheric aerosols are of considerable environmental importance. They modify the radiative budget of Earth by scattering and absorbing radiation, and by providing nuclei for cloud formation. Additionally, they provide surfaces for heterogeneous and multiphase reactions that affect tropospheric chemistry. For example, Dentener and Crutzen (1993) showed that reactions of N2O5 and NO3 with sulfate aerosols may significantly alter the tropospheric concentrations of NO(x), O3, and OH by converting NOx to HNO3 which is rapidly removed by precipitation. Zhang et al. (1994) assumed these same reactions would occur on dust aerosols and showed that dust outbreaks may reduce NO(x) levels by up to 50%. Dentener et al. (1996) studied the possible effect of reactions on dust on sulfate, nitrate, and O3 concentration. Heterogeneous and multiphase reactions on aerosols may also perturb the sulfur cycle the chlorine cycle and the bromine cycle. Because these reactions can release free chlorine and free bromine they might lead to the destruction of ozone in the marine boundary layer that may be important to include in models of tropospheric chemistry. The goal of our proposed work is to examine the role of heterogeneous and multiphase reactions in the tropospheric cycles of reactive nitrogen and sulfur.

Author

Aerosols; Troposphere; Nitrogen Oxides; Oxygen; Atmospheric Chemistry; Atmospheric Composition

20020075017 Spectral Sciences, Inc., Burlington, MA USA

Infrared Airglow and Contamination Modeling ***Final Report, May 1993-Mar. 1999***

Adler-Golden, S. M.; Berk, A.; Acharya, P. K.; Bernstein, L. S.; Oct. 1999; 124p; In English

Contract(s)/Grant(s): F19628-93-C-0049; Proj-S321

Report No.(s): AD-A405178; SSI-TR-333; AFRL-VS-TR-1999-1544; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report describes work performed to evaluate our understanding of infrared (IR) atmospheric phenomenology through comprehensive analysis of spectral and in-band radiance field data. Computer models of atmospheric IR radiation used for these analyses include the standard AFRL (Air Force Research Laboratory) codes MODTRAN, SHARC, and SAMM. MODTRAN is a rapid, local thermodynamic equilibrium (LTE) code for low- to moderate-resolution spectra. SHARC calculates emission and

transmission spectra in the 2 - 40 micrometers region for arbitrary line-of-sight (LOS) paths between 50 and 300 km for both quiescent and auroral conditions. SAMM is the result of integrating MODTRAN and SHARC into a single, seamless code with a unified and correlated radiative transport algorithm applicable at altitudes from ground to 300 km. Detailed comparisons of the models with spectral and in-band radiance data from the CIRRIS-1A Shuttle experiment demonstrate the predictive capabilities of the background models, as well as the variability of IR atmospheric radiance over time and geographic location. In addition, MODTRAN upgrades which address the data/model comparisons and the investigation into the accuracy of MODTRAN in selected radiation transfer applications are discussed.
DTIC
Contamination; Infrared Radiation; Airglow; Atmospheric Physics

20020076102 Idaho National Engineering and Environmental Lab., Idaho Falls, ID USA
Preliminary Efforts to Couple TETRAD with Geophysics Models
Shook, G. M.; Renner, J. L.; Feb. 19, 2002; 1p; In English
Report No.(s): DE2001-797453; INEEL/CON-02-00257; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Geothermal Program at the Idaho National Engineering and Environmental Laboratory is enhancing our reservoir simulation capabilities by writing new subroutines with TETRAD that write necessary files for use with SAIC's geophysics models, including DC Resistivity, SP, and microgravity. This is part of long-term efforts to develop reservoir models that take advantage of various observations that are - or can be - made on both existing fields or during exploration efforts. These new routines will be made available to the TETRAD user community in 2002 through the next release of TETRAD 2002.
NTIS
Geophysics; Geothermal Technology; Microgravity; Mathematical Models

20020076184 Duke Univ., Durham, NC USA
Cutting Costs by Locating High Production Wells: A Test of the Volcano seismic Approach to Finding 'Blind' Resources
Shalev, E.; Malin, P. E.; McCausland, W.; Jun. 06, 2002; 18p
Report No.(s): DE2001-796234; DOE/ID/13863; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In the summer of 2000, Duke University and the Kenyan power generation company, KenGen, conducted a microearthquake monitoring experiment at Longonot volcano in Kenya. Longonot is one of several major late Quaternary trachyte volcanoes in the Kenya Rift. They study was aimed at developing seismic methods for locating buried hydrothermal areas in the Rift on the basis of their microearthquake activity and wave propagation effects. A comparison of microearthquake records from 4.5 Hz, 2 Hz, and broadband seismometers revealed strong high-frequency site and wave-propagation effects. The lower frequency seismometers were needed to detect and record individual phases. Two-dozen 3-component 2- Hz L22 seismographs and PASSCAL loggers were then distributed around Longonot. Recordings from this network located one seismically active area on Longonot's southwest flank. The events from this area were emergent, shallow, small, and spatially restricted. Evidently, the hydrothermal system in this area is not currently very extensive or active. to establish the nature of the site effects, the data were analyzed using three spectral techniques that reduce source effects. The data were also compared to a simple forward model. The results show that, in certain frequency ranges, the technique of dividing the horizontal motion by the vertical motion (H/V) to remove the source fails because of non-uniform vertical amplification. Outside these frequencies, the three methods resolve the same, dominant, harmonic frequencies at a given site. In a few cases, the spectra can be fit with forward models containing low velocity surface layers. The analysis suggests that the emergent, low frequency character of the microearthquake signals is due to attenuation and scattering in the near surface ash deposits.
NTIS
Volcanoes; Wave Propagation; Hydrothermal Systems; Frequency Ranges; Low Frequencies

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METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20020074594 NASA Ames Research Center, Moffett Field, CA USA
Cloud Coverage Enhancement and Nocturnal Drizzle Suppression in Stratocumulus by Aerosols
Ackerman, Andrew S., NASA Ames Research Center, USA; Toon, Owen B., Colorado Univ., USA; Stevens, David E., Lawrence Livermore National Lab., USA; Coakley, James A., Jr., Oregon State Univ., USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Recent satellite observations of ship tracks surprisingly indicate that cloud water decreases with increasing droplet concentrations. However, we find by analyzing detailed simulations of stratocumulus that the reported trend is likely an artifact of sampling, only overcast clouds. The simulations instead show cloud coverage increasing with droplet concentrations, accounting for 25% of cloud albedo increase at moderate droplet concentrations. Our simulations also show that increases in cloud water from drizzle suppression (by increasing droplet concentrations) are favored only at night or at extremely low droplet concentrations, suggesting that the indirect aerosol forcing is overestimated in climate change projections by many general circulation models.
Author
Stratocumulus Clouds; Satellite Observation; Cloud Cover; Drops (Liquids); Climate Change; Aerosols

20020075728 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
First Guess TAF-FGTAF Semi-Automation TAF Production
Jacobs, A.; Aug. 1998; 40p; In English
Report No.(s): PB2002-105048; TR-212; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
The aviation meteorological services (LMD) at the international airport of Schiphol (Amsterdam) in the Netherlands and at the regional civil airports of Gronigen, Maastricht and Rotterdam, are responsible for the supply of accurate meteorological information which is necessary for safety and efficiency in aviation. One of the tasks of the LMD concerns the production and distribution of meteorological forecasts. For reasons of efficiency these meteorological reports or bulletins are distributed in coded form, according to predefined ICAO and WMO regulations. The TAF or the Terminal Aerodrome Forecast contains a categorical and probabilistic weather forecast for a specific airport. In this report the authors shall focus on TAFs.
NTIS
Meteorological Services; Weather Forecasting; Wind (Meteorology); Clouds (Meteorology); Flight Safety

20020075730 National Oceanic and Atmospheric Administration, Boulder, CO USA
Climate Monitoring and Diagnostics Laboratory. Summary Report No. 26„ *2000-2001*
King, D. B.; Schnell, R. C.; Rosson, R. M.; Sweet, C.; Mar. 2002; 226p; In English
Report No.(s): PB2002-106703; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche
The Climate Monitoring and Diagnostics Laboratory (CMDL) is located in Boulder, Colorado, with Baseline Observatories in Barrow, Alaska; Mauna Loa, Hawaii; Cape Matatula, American Samoa; and South Pole, Antarctica. It is one of twelve research components within the Office of Oceanic and Atmospheric Research (OAR) of the National Oceanic and Atmospheric Administration (NOAA). CMDL conducts research related to atmospheric constituents that are capable of forcing change in the climate of the Earth through modification of the atmospheric radiative environment, for example, greenhouse gases and aerosols, and those that can cause depletion of the global ozone layer, for example, chlorine- and bromine-containing compounds. This report is a summary of CMDL activities for calendar years 2000 and 2001. It is the 26th consecutive report issued by this organization and its Geophysical Monitoring for Climatic Change predecessor since formation in 1972. From 1972 through 1993 (numbers 1 through 22), reports were issued annually; thereafter, the reports were issued on a biennial basis. This report is organized into the following major sections: 1. Observatory, Meteorology, and Data Management Operations; 2. Carbon Cycle; 3. Aerosols and Radiation; 4. Ozone and Water Vapor; 5. Halocarbons and other Atmospheric Trace Species; and 6. Cooperative Programs.
NTIS
Atmospheric Composition; Climate Change; Geophysics; Meteorology; Climatology

20020075740 Geological Survey, Water Resources Div., Reston, VA USA
June 2002 Floods in the Red River of the North Basin in Northeastern North Dakota and Northwestern Minnesota
2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-108868; USGS/OFR-02-278; No Copyright; Avail: National Technical Information Service (NTIS)
The Red River of the North is a complex river system in the north-central plains of the USA. The river continues to affect the people and property within its basin. During June of 2002, major flooding occurred for the third time in 5 years in the Red River of the North Basin, especially on tributaries in northwestern Minnesota. This report presents preliminary meteorological data provided by the National Weather Service, Grand Forks Office and water resources 2002 flood data that were obtained from selected streamflow-gaging stations located in the Red River of the North Basin.
NTIS
Floods; Minnesota; North Dakota; River Basins; Meteorology

20020075999 Argonne National Lab., IL USA

Remote sensing of micrometeorological quantities.

Coulter, R. L.; May 15, 2002; 11p; In English

Report No.(s): DE2001-795843; ANL/ER/CP-107678; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

This overview of the uses of sodars in meteorological applications categorizes the applications by signal source, specifically amplitude, frequency, or 'visualization' for example, of vertical time sections of signal amplitude. Examples are shown of data derived from each category. A final section presents the potential for using groups of sodars in networks with other instruments to estimate quantities such as divergence.

NTIS

Micrometeorology; Time Signals; Acoustic Properties

20020076013 Argonne National Lab., IL USA

Atmospheric Radiation Measurement program facilities newsletter, April 2002.

Holdridge, D. J.; Apr. 29, 2002; 3p; In English

Report No.(s): DE2001-795899; ANL/ER/NL-02-04; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The National Oceanic and Atmospheric Administration (NOAA) recently announced the development of El Nino conditions in the tropical Pacific Ocean near the South American coastline. Scientists detected a 4 F increase in the sea-surface temperatures during February. Conrad C. Lautenbacher, NOAA administrator and Under Secretary of Commerce for Oceans and Atmosphere, indicated that this warming is a sign that the Pacific Ocean is heading toward an El Nino condition. Although it is too early to predict how strong the El Nino will become or the conditions it will bring to the USA, Lautenbacher said that the country is likely to feel the effects as soon as midsummer. During the last El Nino in 1997-1998, the USA experienced strong weather impacts. Even though researchers don't understand what causes the onset of El Nino, they do recognize what to expect once development has begun. Scientists can monitor the development of El Nino through NOAA's advanced global climate monitoring system of polar-orbiting satellites and 72 ocean buoys moored across the equator in the Pacific Ocean. The resulting measurements of surface meteorological parameters and upper ocean temperatures are made available to scientists on a real-time basis, allowing for timely monitoring and predictions. This complex monitoring array enabled NOAA to predict the 1997-1998 El Nino six months in advance.

NTIS

Meteorological Parameters; Radiation Measurement; Atmospheric Radiation; Climatology

20020076017 Argonne National Lab., IL USA

Elevated stratified layers observed during VTMX.

Coulter, R. L.; Pekour, M. S.; Martin, T. J.; Mar. 14, 2002; 6p; In English

Report No.(s): DE2001-795846; ANL/ER/CP-107088; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A suite of instrumentation including a minisodar, a low-frequency, single-axis sodar, a wind profiling radar and a tethersonde was used during the Vertical Transport and Mixing field study in Salt Lake City, UT, USA, to study the evolution and dynamics of stratified layers that commonly develop during nighttime. The month-long field study provided ten nights with good conditions for tethersonde flights. The real-time sodar display was used to place the tethersonde within and near the stratified layers and to make multiple transects, while atmospheric temperature, moisture, wind speed and wind direction were measured. Not surprisingly, the existence of layers with enhanced acoustic scattering correlated well with regions of potential temperature inversions; however, because wind speeds were invariably low, the Richardson number was rarely less than 0.25. The possible role of moisture in the dynamics of elevated stable layer is discussed.

NTIS

Lakes; Temperature Inversions; Atmospheric Circulation; Atmospheric Temperature; Wind (Meteorology)

20020076040 Argonne National Lab., IL USA

Atmospheric Radiation Measurement program facilities newsletter, May 2002.

Holdridge, D. J.; Jun. 03, 2002; 3p; In English

Report No.(s): DE2001-795900; ANL/ER/NL-02-05; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Eight eddy correlation (ECOR) flux measurement systems are now deployed throughout the ARM SGP CART site. These systems are used to determine the flux (flow) of sensible heat, the flux of latent heat, and air momentum just above cropland a few hundred feet upwind of the ECOR locations. Sensible heat is energy we feel as warmth. Latent heat is the energy that evaporated water vapor measured in the atmosphere. The ECOR systems actually measure wind velocity and temperature fluctuations, water vapor, and barometric pressure. The surface flux values for sensible heat, latent heat, and momentum are calculated from these measurements.
NTIS
Heat Flux; Solar Radiation; Water Vapor; Atmospheric Pressure; Wind Velocity; Flux Quantization; Atmospheric Radiation

20020076078 Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Inst. fuer Hochfrequenztechnik und Radarsysteme, Oberpfaffenhofen, Germany
Polarimetric Methods for Remote Sensing of the Atmosphere: Estimation of the Dropsize Distribution of Precipitation and Estimation of the Rainrate in Different Polarization Bases ***Polarimetrische Methoden der Fernerkundung der Atmosphaere: Bestimmung der Tropfengroessedichteverteilung von Niederschlag und Bestimmung der Regenrate bei der Wahl unterschiedlicher Polarisationsbasen***
Lamprecht, Katja, Deutsches Zentrum fuer Luft- und Raumfahrt e.V., Germany; June 2000; ISSN 1434-8454; 184p; In German
Report No.(s): DLR-FB-2000-36; Copyright; Avail: Issuing Activity

This study reports on the potential of polarimetric information for the estimation of the dropsize distribution (DSD) of rain and for the estimation of rainrates. It discusses the data of several precipitation events recorded with the DLR weather radar in three different polarization bases (linear HV, linear +/-45 deg, left/right circular) and compares the results for DSD and the rainrates estimated in these bases. This study gives an overview of different DSD functions and methods for rainrate estimation and provides furthermore the theoretical background for the representation of polarization states of plane waves and the theory of transforming the scattering properties of raindrops into other polarization bases. Detailed simulation and sensitivity studies enable the estimation of the influence of measurement errors on the results of the inverse scattering problem.
Author
Meteorological Radar; Polarimetry; Raindrops; Drop Size

20020076085 National Defence Research Establishment, Div. of Defence Analysis, Stockholm, Sweden
Ice-Storm in Canada ***Isstormen i Kanada***
Fischer, G.; Molin, S.; May 2001; In Swedish; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-104672; FOI-R-0103-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The ice storm that hit eastern Canada and Northeastern USA in January 1998 crippled significant parts of especially the provinces of Quebec and Ontario. The ice storm made severe damages to the power grid which caused extensive consequences for the whole society. More than 5 million people were affected by the power outages. The crisis that followed lasted for more than five weeks and the power supply was unstable well into February 1998. The Swedish Agency for Civil Emergency Planning (OCB) commissioned the Swedish Defense Research Agency (FOI) to study the 1998 ice storm. In this report the authors are giving an account of what consequences an ice storm and power failures in a modern society can cause. The authors also describe how different actors managed the crisis, and the authors present some lessons that could be learned from the ice storm.
NTIS
Power Plants; Failure Analysis; Storms (Meteorology); Ice

20020076299 NASA Goddard Space Flight Center, Greenbelt, MD USA
Session A-14: Variability of Storm Tracks Storm Tracks and Unseasonable Temperatures in Europe in December 2001
Przybylak, R., Nicholas Copernicus University, Poland; Ardizzone, J., General Sciences Corp., USA; Atlas, R., NASA Goddard Space Flight Center, USA; Koslowsky, D., Berlin Free University, Germany; Otterman, J., NASA Goddard Space Flight Center, USA; Rogers, J., Ohio State Univ., USA; Starr, D., NASA Goddard Space Flight Center, USA; [2002]; 1p; In English; AGU Spring Meeting, 28-31 May 2002, Washington, DC, USA; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In December 2001, a series of cyclonic centers progressed rapidly into Europe from the west and north. The cyclones moved in generally similar directions, along paths separated by few hundreds of kilometers. The advancing cyclones brought the usual sequence of changing wind directions and produced some high speed wind events. We investigate the wind patterns for this month based on analyses derived the Special Sensor Microwave/Imager observations and NCEP analyses. Whereas southwesterlies from the North Atlantic produced moderate temperatures early in the month, strong northerlies and northwesterlies (up to 15 m/s on

20-22 December) produced a drop in daily minimum and maximum temperatures of 18.8 C and 9.9 C, respectively, over a 4 day period (to -18.8 C and -6.8 C, respectively, on December 23 in Torun, Poland). Such low values in December are unprecedented in recent decades, though not for January or February.
Author
Cyclones; Europe; Wind (Meteorology); Wind Direction

20020076310 Technische Univ., Faculty of Civil Engineering and Geosciences, Delft, Netherlands
El Nino and Satellite Altimetry: Observation of Large-Scale Waves on the Pacific Ocean
Brink, W.; May 1999; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-105907; No Copyright; Avail: National Technical Information Service (NTIS)

Altimeter satellites have been proven to be one of the main sources of information in oceanography. The basic concept is very simple. A satellite is used as a moving platform for a sensor, which transmits pulses in the radar frequency domain to the ground, and receives the return signal after reflection at the Earth's surface. The altitude of the satellite above the Earth can be derived from the travel time of the signal, and compared with orbital models, so information of the sea level can be obtained. Due to mass distribution variations in the Earth's interior, the oceans in rest are not an ellipsoid, but they largely coincide with an equipotential surface, the geoid, which deviates from an ellipsoid by about 100 m. Since the oceans are not at rest, but influenced by e.g. the atmosphere, there's a small deviation in the order of 1 m of the sea surface from this geoid, which is the dynamic ocean topography.
NTIS
El Nino; Satellite Altimetry; Ocean Dynamics; Oceanography; Water Waves; Mass Distribution

20020076320 Swedish Transport and Communications Research Board, Stockholm, Sweden
Salmon's Hamiltonian Approach to Balanced Flow Applied to a One-Layer Isentropic Model of the Atmosphere
Verkley, W. T. M.; 2001; In English; This document is color dependent and/or in landscapce layout. It is currently only available on CD-ROM
Report No.(s): PB2002-105673; WR-2000-03; No Copyright; Avail: National Technical Information Service (NTIS)

Salmon's Hamiltonian approach is applied to formulate a balanced approximation to a hydrostatic one-layer isentropic model of the atmosphere. The model, referred to as the parent model, describes an idealized atmosphere of which the dynamics are closely analogous to a one-layer shallow-water model on the sphere. Salmon's Hamiltonian approach is applied to obtain an equation for the time-change of the balanced velocity that guarantees both material conservation of potential vorticity, as well as conservation of energy. New in this application of Salmon's approach is a nonlinear relation between Montgomery potential and surface pressure (characteristic for an isentropic ideal gas in hydrostatic equilibrium) in combination with spherical geometry and a variable Coriolis parameter. We will discuss how the unbalanced velocity va can be calculated in a practical way and how the model can be stepped forward in time by advecting the balanced potential vorticity with the sum of the balanced and unbalanced velocity. The balanced model is tested against a ten-day period from a long integration with the parent model.
NTIS
Atmospheric Models; Hamiltonian Functions; Vorticity; Coriolis Effect

20020076323 EVS Environment Consultants, Inc., Seattle, WA USA
NESDIS: A Strategic Approach for the New Millennium
2001; In English; This document is color dependent and/or in landscape layout. It is currenty only available on CD-ROM
Report No.(s): PB2002-108114; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Mission; Vision; Our Program Goals and Themes; NESDIS (National Environmental Satellite and Data Information Service) Values; Our Critical Role for the Nation; Benefits to the National and the Economy; NESDIS Strategic Goals; NESDIS Strategic Program Themes; Supporting NOAA and DOC Strategic Goals; Services for Tomorrow.
NTIS
NOAA Satellites; Project Planning

20020076351 State Dept., Bureau of Oceans and International Environmental and Scientific Affairs, Washington, DC USA
US Climate Action Report, 2002: Third National Communication of the USA of America Under the United Nations Framework Convention on Climate Change
May 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM
Report No.(s): PB2002-109018; No Copyright; Avail: National Technical Information Service (NTIS)

Contents include the following: Introduction and Overview; National Circumstances; Greenhouse Gas Inventory; Policies and Measures; Projected Greenhouse Gas Emissions; Impacts and Adaptation; Financial Resources and Transfer of Technology; Research and Systematic Observation; Education, Training, and Outreach; and Appendices.
NTIS
USA; Trends; Climate Change; Greenhouse Effect

20020076382 Meteorological Satellite Center, Kiyose, Japan
Monthly Report of Meteorological Satellite Center: June 2002 ***Monthly Report, Jun. 2002***
June 2002; In English; In Japanese; CD-ROM conforms to the ISO 9660 standard for a volume and file structure; Copyright; Avail: Issuing Activity

The CD-ROM concerning the 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 following observation data: Full Disk Earth's Cloud, 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 Irradiation, 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, TOVS Total Ozone Amount.
Author
Meteorological Satellites; Satellite Observation; Satellite Sounding

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.

20020075739 National Ocean Service, Office of National Marine Sactuaries, Silver Spring, MD USA
Flower Garden Banks, National Marine Sanctuary: A Rapid Assessment of Coral, Fish, and Algae Using the AGRRA Protocol
Aug. 2000; 26p
Report No.(s): PB2002-108682; MSD-00-3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Flower Garden Banks are topographic features on the edge of the continental shelf in the northwest Gulf of Mexico. These banks are approximately 175 km southeast of Galveston, Texas at 28 degrees north latitude and support the northernmost coral reefs on the North American continental shelf. The East and West Flower Garden Banks (EFG and WFG) and Stetson Bank, a smaller sandstone bank approximately 110 km offshore, are managed and protected as the Flower Garden Banks National Marine Sanctuary (FGBNMS). As part of a region-wide initiative to assess coral reef condition, the benthic and fish communities of the EFG and WFG were assessed using the Atlantic and Gulf Rapid Reef Assessment (AGRRA) protocol. The AGRRA survey was conducted during a week-long cruise in August 1999 that was jointly sponsored by the FGBNMS and the Reef Environmental Education Foundation (REEF). A total of 25 coral transects, 132 algal quadrats, 24 fish transects, and 26 Roving Diver (REEF) surveys were conducted. These surveys revealed reefs with high coral cover, dominated by large, healthy corals, little macroalgae, and healthy fish populations. The percent live coral cover was 53.9 and 48.8 at the WFG and EFG, respectively, and the average colony diameter was 93 and 81 cm. Fish diversity was lower than most Caribbean reefs, but large abundances and size of many species reflected the low fishing pressure on the banks. The benthic and fish assemblages at the EFG and WFG were similar. Due to its near pristine conditions, the FGB data will prove to be a valuable component in the AGRRA database and its resulting scale of reef condition for the region.
NTIS
Algae; Coral Reefs; Fishes; Ocean Bottom; Topography; Marine Biology; Protocol (Computers)

20020075967 National Ocean Service, Office of National Marine Sanctuaries, Silver Spring, MD USA
National Marine Sanctuary Management Plan Handbook
Feb. 2002; 162p; In English
Report No.(s): PB2002-108862; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Management plans are site-specific documents that the National Marine Sanctuary Program (NMSP) uses to manage individual Sanctuaries. Management plans: summarize existing programs and regulations; guide preparation of annual operating

plans; articulate visions, goals, objectives, and priorities; guide management decision making; guide future project planning; ensure public involvement in management processes; and contribute to the attainment of system goals and objectives. This handbook has been prepared to act as a reference book for participants in the management plan review process for the NMSP. The handbook may also be used for informational purposes for other parties, including Sanctuary Advisory Council members, jurisdictional partners in other government agencies, managers of marine protected areas (MPAs) outside the NMSP, and interested members of the public.
NTIS
Handbooks; Management Planning; Marine Biology

20020076118 Royal Netherlands Meteorological Inst., De Bilt, Netherlands
Implementation of Two Mixed-Layer Schemes in the HOPE Ocean General Circulation Model
van Eijk, M.; Dec. 1998; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-105049; TR-214; No Copyright; Avail: National Technical Information Service (NTIS)

Two mixed-layer schemes are implemented in the HOPE Ocean General Circulation Model that is used at the European Center for Medium-Range Weather Forecasts (ECMWF). They are nonlocal diffusion (NLD) scheme based on the KPP model, and a bulk mixed-layer (BML) scheme based on the model by Sterl and Kattenberg. The aim of the implementation was to embed the mixed-layer schemes in the HOPE model with minor modifications to the original code. by setting a single switch one can choose one of the new mixed-layer schemes or the original HOPE mixing scheme.
NTIS
Boundary Layers; Ocean Currents; Ocean Dynamics

20020076176 California Univ., San Diego, La Jolla, CA USA
Measurements of Surface Ocean Carbon Dioxide Partial Pressure During WOCE
Weiss, R. F.; Oct. 15, 1998; 58p; In English
Report No.(s): DE2001-761916; No Copyright; Avail: Department of Energy Information Bridge

All of the technical goals of the World Ocean Circulation Experiment (WOCE) field program which were supported under the Department of Energy research grant 'Measurements of Surface Ocean Carbon Dioxide Partial Pressure During WOCE' (DE-FG03-90ER60981) have been met. This has included the measurement of the partial pressures of carbon dioxide (CO(sub 2)) and nitrous oxide (N(sub 2)O) in both the surface ocean and the atmosphere on 24 separate shipboard expedition legs of the WOCE Hydrographic Programme. These measurements were made in the Pacific, Indian and Atlantic Oceans over a six-and-a-half year period, and over a distance of nearly 200,000 kilometers of ship track. The total number of measurements, including ocean measurements, air measurements and standard gas measurements, is about 136,000 for each gas, or about 34,000 measurements of each gas in the ocean and in the air. This global survey effort is directed at obtaining a better understanding of the role of the oceans in th e global atmospheric budgets of two important natural and anthropogenic modulators of climate through the 'greenhouse effect', CO(sub 2) and N(sub 2)O, and an important natural and anthropogenic modulator of the Earth's protective ozone layer through catalytic processes in the stratosphere, N(sub 2)O. For both of these compounds, the oceans play a major role in their global budgets. In the case of CO(sub 2), roughly half of the anthropogenic production through the combustion of fossil fuels has been absorbed by the world's oceans. In the case of N(sub 2)O, roughly a third of the natural flux to the atmosphere originates in the oceans. As the interpretation of the variability in the oceanic distributions of these compounds improves, measurements such as those supported by this research project are playing an increasingly important role in improving our understanding of natural and anthropogenic influences on climate and ozone.
NTIS
Carbon Dioxide; Ocean Currents; Oceans; Partial Pressure; Ozonosphere

20020076251 Swedish Defence Research Establishment, Div. of Systems Technology, Stockholm, Sweden
Open Boundary Conditions for Barotropic Waves
Nycander, J.; Doeoes, K.; Mar. 2001; 78p; In English
Report No.(s): PB2002-104998; FOI-R-0078-SE; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Open boundary conditions (OBCs) should give low artificial reflection of outgoing waves. Most OBCs proposed in the literature try to take into account the fact that the phase velocity of these waves is a priori unknown. However, an even more important problem is the presence of a 'slow mode', i.e. a quasi-stationary geostrophic flow, at the open boundary. This geostrophic flow should be separated from the superimposed waves when constructing the OBC. It is also important to write the

OBC on integrated form, in order to obtain a well-posed problem and avoid model drift. Two new conditions are derived using these ideas, and are show to perform than previous conditions.
NTIS
Boundary Conditions; Oceanography

20020076252 Stockholm Univ., Sweden
Perturbative Analysis of a Sill-Flow Problem within Rotating-Channel Hydraulics
Laanearu, J.; 2001; 38p; In English
Report No.(s): PB2002-105888; DM-86; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Power series solutions are presented for the problem of hydraulic flow through a rotating channel of parabolic cross-section. The perturbative scheme is based on employing the well-known results for the case of a deep upstream basin as a lowest-order solution. The higher-order corrections of the power series incorporate the effects of upstream-basin circulation, a characteristic feature of the general theory of rotating-channel flow for uniform non-zero potential vorticity. A variety of techniques has been used to investigate and improve the convergence of the expansions. The dominating singularities affecting the convergence properties of the perturbative series have been determined using the graphical Domb-Sykes ratio tests. Various transformations of the expansion coefficients (such as conformal mapping and reversion of series) have been applied to extend the parametric range of utility of the series and to furthermore accelerate their convergence.
NTIS
Hydraulics; Channel Flow

20020076346 National Oceanic and Atmospheric Administration, Coastal Ocean Program Office, Silver Spring, MD USA
Digital Management Systems for Digital Side Scan Data and Shallow Water Multibeam Data
Gardner, J. C.; Glang, G. F.; Noll, G. T.; Jacobs, T. R.; 2002; 16p; In English
Report No.(s): PB2002-108971; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Coast Survey, Hydrographic Surveys Division is developing data management systems to handle large volumes of digital data on board NOAA's hydrographic survey vessels and at NOAA's hydrographic processing centers. The need for these data systems is predicated on the deployment of new acquisition systems aboard NOAA hydrographic vessels, and the expected data load from recently initiated contracts for hydrographic data. This paper reports on the Coast Survey's approach to hydrographic data management systems capable of terabyte-level capacities and fast data throughput.
NTIS
Oceanography; Hydrology; Surveys; Data Base Management Systems; Data Management

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.

20020074082 NASA Ames Research Center, Moffett Field, CA USA
The Biogeochemistry of Benthic Photosynthetic Communities
Bebout, Brad, NASA Ames Research Center, USA; Jun. 25, 2002; 1p; In English; GeoBiology Summer 2002 Field Course, 20-27 Jul. 2002, Catalina Island, CA, USA
Contract(s)/Grant(s): RTOP 344-38-00-05; No Copyright; Avail: Issuing Activity; Abstract Only

Microbial mats are our earliest, and most pervasive evidence of life on Earth. In addition to their importance as the crucible of microbial evolution on Earth, microbial mats may be important in our search for life outside of our solar system. This lecture will introduce various types of microbial mats, and their fossilized counterparts, stromatolites by presenting examples of these communities. Biogeochemical cycles important in microbial mats will be introduced and discussed.
Author
Biogeochemistry; Microorganisms; Ocean Bottom; Life Sciences

20020074378 General Accounting Office, Washington, DC USA

HIPAA STANDARDS: Dual Code Sets Are Acceptable for Reporting Medical Procedures

Aug. 2002; 37p; In English

Report No.(s): AD-A404803; GAO-02-796; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Medical care involves the provision of a myriad of health-related services, from the diagnosis of medical condition to its treatment. A means to consistently classify, define, and distinguish among these and other health-related services is critical for reimbursing providers and analyzing health care utilization, outcomes, and cost. Codes serve this role by assigning each distinct service a unique identifier. Health care providers, such as hospitals and physicians, report medical conditions and the health-related services they have provided to patients on medical records, which are in turn transcribed into corresponding codes by coding professionals. These codes are then reported on claims forms and submitted to both public and private payers for payment. In addition to their use in these financial and administrative transactions, codes facilitate the analysis of data that are used in motoring resource utilization and cost; measuring the quality, safety, and efficacy of care; analyzing outcomes of treatment options; and identifying fraud and abuse. Until recently, there was wide variability in requirements for coding health-related services, such as procedures, diagnoses, medical devices, supplies, and prescription drugs. For example, coding requirements could vary from payer to payer, making the filing of claims with multiple payers administratively burdensome for providers. In addition, this wide variability in coding made it difficult to electronically transmit standardized health-related information and compromised the reliability of health-related data. In enacting the Health Insurance Portability and Accountability Act of 1996 (HIPAA), the Congress sought to simplify data reporting and claims processing requirements across all providers and payers and facilitate the electronic transmission of health-related information.

DTIC

Medical Services; Coding; Classifications

20020074385 Beth Israel Deaconess Medical Center, Boston, MA USA

Regulation of Breast Carcinoma Progression by the Alpha-6 Integrins ***Final Report, 1 Sep. 1997-31 Aug. 2001***

Shaw, Leslie M.; Mercurio, A.; Oct. 2001; 72p; In English

Contract(s)/Grant(s): DAMD17-97-1-7313

Report No.(s): AD-A404843; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

During this career development award, I have made significant progress in determining the contribution of the alpha 6 beta 1 integrin receptors to breast cancer. We had previously established that the alpha 6 beta 1 receptor contributes to the growth and survival of breast carcinoma metastases. In addition, we had demonstrated that de novo expression of the integrin beta 4 subunit in breast carcinoma cell lines that lack this integrin subunit increases their invasive potential. During this award period, my work has resulted in an increased understanding of alpha 6 beta 1-dependent breast carcinoma survival and the important role of PI3K and Akt in this function. I have demonstrated that the ability of the alpha 6 beta 4 integrin to promote invasion is related to its activation of phosphoinositide 3-OH kinase (PI3K) and the downstream effectors Rac and PKC epsilon. I identified IRS-1 and IRS-2 as intermediates in the alpha 6 beta 4-dependent activation of PI3K and demonstrated that Y1494 in the beta 4 subunit is essential for this signaling pathway. Finally, I have established an involvement of the src family in alpha 6 beta 4-dependent breast carcinoma invasion. Importantly, this career development award has contributed to my promotion to Assistant Professor, my recruitment to the BIDMC Pathology Department, and my obtaining an NIH-R01 Award that is focused on breast cancer.

DTIC

Metastasis; Cancer; Pathology; Receptors (Physiology)

20020074386 Pittsburgh Univ., Pittsburgh, PA USA

Acceptance of Referral for Cancer-Risk Counseling in Population of Women Undergoing Breast Biopsy: Variables Predicting Followup at a Cancer Genetics Program ***Annual Report***

O'Neill, Suzanne; Rubenstein, Wendy S.; Aug. 2001; 13p; In English

Report No.(s): AD-A404842; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study was designed to demonstrate the utility of brief quantitative risk assessment in breast care clinical settings as a method of referral to cancer risk counseling. We examined factors that influence the decision to undergo cancer risk counseling after the referral is made. We developed a computerized program, BRISK, that calculates interval breast cancer risks using the Gail and Claus epidemiological models, and BRCA1 and BRCA2 mutation probabilities using the Couch, Shattuck-Eidens, Frank, and BRCAPRO models. Questionnaires assessing psychological status, and knowledge and attitudes about breast cancer, cancer risk counseling, and genetic testing were used to identify predictors of referral uptake. of the 120 subjects in the biopsy setting, 53% had breast cancer risk is greater than - twice the population risk as measured by the epidemiological models. of the 91 women in the treatment selling, 47% had a BRCA mutation risk is greater than - 10%. Uptake of referral was low in the biopsy

group (1/63), but higher in the treatment group (13/43). Predictors of uptake included family history of cancer, interest in family risks, high income, psychological disturbance, and perceived risk. Barriers included lack of time, cost, and fear of insurance discrimination. However, 81% thought brief risk assessment should be routine, suggesting annual mammography or OB/GYN visits as the most effective selling. Brief breast cancer risk assessment is easily incorporated into clinical settings and is well-accepted by most patients. It can be utilized not only for management of individuals, but also for public health intervention, resource allocation, and targeted research.
DTIC
Surgery; Cancer; Risk; Assessments; Epidemiology

20020074387 Hospital for Sick Children, Toronto, Ontario Canada
Role of the Integrin-Linked Kinase, ILK, in Mammary Carcinogensis ***Final Report, 25 Jul. 1997-24 Jul 2000***
Hannigan, Gregory E.; Aug. 2000; 66p; In English
Contract(s)/Grant(s): DAMD17-97-1-7092
Report No.(s): AD-A404841; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Yeast two-hybrid screens for proteins interacting with the integrin linked kinase, ILK1, identified a protein phosphatase 2C, ILKAP, that blocks ILK1 activity and signaling. A second interacting protein contains two calponin homology (CH) domains, suggestive of actin-binding function. Conditional expression of ILKAP indicated that it selectively inhibited ILK1 kinase activity, and subsequent signaling through GSK3-beta and beta-catenin, components of the Wnt signal transduction pathway. This down-regulation requires ILKAP catalytic activity. A second interacting protein, Clint, contains a tendem arrangement of two calponin homology (CH) domain suggestive of actin-binding function. ILK1 binds to the C-terminal CH domain of Clint. Clint mRNA is highly preferentially expressed in human strained muscle tissues, and an apparently single protein of apparent molecular weight of 35 kDa is recognized by antibodies raised to a Clint fusion protein. Interaction of ILK1 with Clint may require the catalytic function of ILK1 since a kinase-dead version of ILK was deficient for Clint binding. As this kinase dead ILK1 acts as a dominant negative mutation, this suggests Clint interactions are important in ILK1-mediated signaling. ILK1 can phosphorylate recombinant Clint protein, indicating that Clint could be a physiologic substrate for ILK1. We characterize a regulator and a potential substrate, of ILK1.
DTIC
Epithelium; Mammary Glands; Catalytic Activity; Enzyme Activity; Genetics; Carcinogens

20020074563 Cambridge Univ., Cambridge UK
Characterization of Two C. elegans Homologuses of Oncogenic Inhibitor of Apoptosis Proteins (IAPs) and Identification of Interacting Genes ***Annual Report, 1 Aug. 2000- 1 Aug 2001***
Fraser, Andrew G.; Sep. 2001; 7p; In English
Contract(s)/Grant(s): DAMD17-99-1-9135
Report No.(s): AD-A404921; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Although there is now a phenomenal quantity of sequence data available, biological function has only been assigned to a small percentage of predicted genes in any metazoan. Understanding how genetic information relates to biological function at the level not only of a single gene but of an entire genome is thus a key problem. One approach is to analyse loss-of-function phenotypes of every predicted gene and thus attempt to draw both global and particular conclusions about the relationship between gene sequence, predicted protein product and function in the organism. This is the approach that I have been pursuing for the last 2 years in the nematode worm, C. elegans. We have generated a reagent that uses RNA-mediated interference (RNAi) to individually inhibit -90% of all -19,000 predicted genes in the C. elegans genome simply by feeding dsRNA-expressing bacteria to worms. This technique is both efficient and technically easy, so a single person can analyse loss-of-function phenotypes of up to 1000 genes in a single day for minimal cost; in addition, the reagent can be used an indefinite number of times. In essence, most genetic screens in C. elegans that could hitherto be carried out using standard forward genetics can now be carried out using our RNAi reagent, which has the advantage that any detected phenotype is automatically related to gene sequence, obviating the need for positional cloning.
DTIC
Apoptosis; Proteins; Genes; Cancer; Mammary Glands

20020074564 Missouri Univ., Columbia, MO USA

Phage Fab Display Selection in Vitro and In Vivo: Novel Means to Identify New Breast Cancer Avid Compounds ***Annual Report***

Meighan, Mark A.; Apr. 2002; 8p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-00-1-0350

Report No.(s): AD-A404909; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Breast cancer is the number one cause of death amongst cancer in women. New methods for early detection diagnosis and treatment of cancer are always sought. In this annual report we discuss the initial findings from in vivo affinity selection where we have sought to isolate Fabs that bind tumor material in tumor-bearing mice. Breast tumor cell line T47-D was used to produce xenografts in female SCID mice. Mice were injected with Fab-phage library and phage allowed to circulate for one hour. Tumor material was removed and binding phage isolated for amplification as the input for a subsequent round of in vivo biopanning. Five rounds were achieved. Fabs have been isolated from the final round and the DNA encoding them is being sequenced. Several Fabs will be assessed for binding to tumor material and extracted proteins and may be further mutated or engineering to incorporate radiometal atom binding sites for detection and imaging of primary tumors and metastases both in vitro and in vivo settings. DTIC

Bacteriophages; Cancer; Mammary Glands; Cells (Biology); In Vivo Methods and Tests; In Vitro Methods and Tests

20020074566 Naval Health Research Center, San Diego, CA USA

Effectiveness of an Alcohol Abuse Secondary Prevention Program Among Marine Corps Aviation Personnel ***Annual Report, 1 May 2001-30 Apr. 2002***

Hurtado, Suzanne L.; Simon-Arndt, Cynthia M.; Patriarca-Troyk, Laura; May 2002; 13p; In English

Contract(s)/Grant(s): MIPR-1FCDMGM1085

Report No.(s): AD-A404917; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study is to develop an enhanced alcohol misuse secondary prevention training program for Marine Corps aviation personnel and to evaluate its effectiveness in reducing drinking levels and alcohol-related negative consequences. The evaluation will be conducted with Marine Corps personnel in aviation squadrons using a repeated-measures study with a control group. Alcohol-related problems will be monitored during a 6-month baseline period and then an anonymous survey of alcohol use will be administered prior to the intervention. The training program will be given to the intervention squadrons followed by an anonymous post-intervention survey, and two follow-up surveys for all participants. Alcohol-related problems will continue to be monitored during the 6-month follow-up period. During the first year, contacts within the 3rd Marine Aircraft Wing were made and support was granted by the Commanding General. Available squadrons were identified for participation in the evaluation and the first two months of pre-intervention, alcohol-related incident data were collected. Modifications to the educational program content have begun and the development of a computerized self-assessment and feedback tool was integrated into the program. Focus groups were conducted with aviation personnel at several Marine Corps Air Stations to identify aviation-specific factors that may affect drinking behavior. DTIC

Drinking; Armed Forces (USA)

20020074567 Vanderbilt Univ., Medical Center, Nashville, TN USA

Blockade of Tumor Cell TGF-Betas: A Strategy to Reverse Antiestrogen Resistance in Human Breast Cancer ***Final Report, 1 Jan. 1999-31 Dec. 2001***

Arteaga, Carlos L.; Jan. 2002; 112p; In English

Contract(s)/Grant(s): DAMD17-98-1-8262

Report No.(s): AD-A404918; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Transforming growth factor beta (TGF beta) is a pleiotropic growth factor, which plays a critical role in modulating cell growth, differentiation and plasticity. There is increasing evidence that after transformed cells lose their sensitivity to TGF beta-mediated growth inhibition, autocrine TGF Beta signaling may potentially promote tumor cell motility, invasiveness, and metastatic progression. In order to understand the molecular mechanisms by which autocrine TGF beta may selectively contribute to tumor cell progression, we have performed a series of studies using mouse and human mammary tumor cells. Collectively, these studies indicate that signaling by phosphatidylinositol-3 kinase (PI3K), Akt, and p38 Mapk are required for TGF Beta-mediated epithelial-to-mesenchymal transition (EMT) and cell motility. In addition, Smad signaling does not appear to be involved in these processes, in that forced expression of Smad 2/4 and Smad 3/4 at levels adequate to induce robust TGF Beta reporter activity, failed to induce EMT and cell migration. Therefore, Smad signaling does not appear to be involved in the tumor-promoting effects of

signaling by the TGF Beta network. Furthermore, PI3K, Akt, and p38 Mapk represent rational molecular targets for treatment approaches aimed at interfering with the tumor promoting effects of the TGF betas.
DTIC
Cells (Biology); Mammary Glands; Carcinogens; Cancer

20020074568 General Accounting Office, Washington, DC USA
MEDICAID and SCHIP: Recent HHS Approvals of Demonstration Waiver Projects Raise Concerns
Jul. 2002; 71p; In English; Report to the Committee on Finance, U.S. Senate
Report No.(s): AD-A404905; GAO-02-817; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

States provide health care coverage to about 40 million low-income uninsured adults and children largely through two federal-state programs-Medicaid and the State Children's Health Insurance Program (SCHIP). Medicaid generally covers low-income families and elderly and disabled individuals, while SCHIP provides health coverage to children in families whose incomes, while low, are above Medicaid's eligibility requirements. to receive federal funding, which covered on average about 57 percent of Medicaid expenditures and 72 percent of SCHIP expenditures in 2001, states must meet certain statutory requirements including providing a certain level of benefits to specified populations. Under section 1115 of the Social Security Act, the Secretary of Health and Human Services (HHS) can waive many of the statutory requirements in the case of experimental, pilot, or demonstration projects that are likely to promote program objectives. As part of their responsibility to protect the fiscal integrity of the programs, traditionally, HHS and the Office of Management and Budget (OMB) have had a policy that all approved waiver projects be "budget neutral" for the federal government-that is, the proposed project cannot result in federal expenditures that are higher than they would have been without the project.
DTIC
Health; Sociology; Insurance (Contracts); Federal Budgets

20020074569 Howard Univ., Washington, DC USA
High Temperature Superconductor RF Probes for Breast Cancer Research
Wang, Paul C.; Oct. 2001; 38p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-96-1-6289
Report No.(s): AD-A404908; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Nuclear magnetic resonance imaging and spectroscopy techniques have been used to study the breast cancer cells and tumor grown on animal. The goal of this study is to gain knowledge, which could be useful to improve the specificity of diagnosis and staging of breast cancer in clinic. Intrinsically, NMR techniques have weak signals, which limit the ultimate spatial resolution in image and sensitivity in spectrum. A high temperature superconductor RF probe has been constructed, which has a Q value 650, to improve NMR sensitivity. An improved cell perfusion system was made to continuously run spectroscopy study longer than 8 days. Many phosphorus metabolites of MCF7 breast cancer cells have been identified. There is a subtle difference between MCF7/WT and MCF7/ADR cells. Glycerophosphocholine is lower than phosphocholine for the MCF7/ADR cells. 2 Micro-M Doxorubicin dramatically affected MCF7/WT cells but not MCF7/ADR cells. T1 relaxation times of the phosphorus metabolites are measured. The NMR spectrum shows significant lower PC and ATP and higher Pi signals in tumor than the muscle. High-resolution imaging technique with injection of contrast agent shows a significant non-uniform image enhancement throughout the tumor. Small blood vessels can be identified at peripherals but not at the core of tumor.
DTIC
Cancer; High Temperature Superconductors; Imaging Techniques; Mammary Glands; Radio Frequencies

20020074574 Michigan Univ., Ann Arbor, MI USA
Organic Polymer Light Emitting Display for Digital Mammography ***Annual Report, 1 Mar. 2001-28 Feb. 2002***
Kimis, Joohan; Mar. 2002; 20p; In English
Contract(s)/Grant(s): DAMD17-00-1-0343
Report No.(s): AD-A404888; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed simulation tools for the optimization of the organic light-emitting device (OLED) high-resolution monochrome structures for medical imaging applications. We studied the effect of thin-film coatings and optical absorption in the organic materials on the emitted OLED spectra. We investigated advanced measurement methods for the characterization of display prototypes that will be fabricated in the University of Michigan laboratories. Using measured optical properties of the materials involved in a typical OLED structure, we computed the color shift from the photo-luminescent spectrum. In a submitted manuscript, we reported on the Monte Carlo method for modeling light transport phenomena in multi-layer organic polymer light-emitting devices on plastic substrates. We find that for all polymers considered, the emission is shifted toward the longer

wavelengths, and that the shift is maximum for emissions with peaks around 530 nm. The photon extraction efficiency is higher (0.430) for polymers emitting in the longer wavelengths, while the absorbed fraction is higher (0.676) for spectra with maximum in the short wavelengths.
DTIC
Digital Systems; Optical Properties; Light Transmission; Imaging Techniques; Emittance; Organic Materials; Polymers; Fabrication

20020074577 Tufts Univ., Boston, MA USA
Identification of Checkpoint Genes Involved in the kar3 Cell Cycle Arrest ***Annual Report, 15 Aug. 1999-14 Aug 2001***
Shanks, Robert M. Q.; Dawson, Dean; Sep. 2001; 18p; In English
Contract(s)/Grant(s): DAMD17-99-1-9412
Report No.(s): AD-A404880; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

KAR3 encodes a kinesin-like motor protein that has a wide variety of roles in the budding yeast Saccharomyces cerevisiae. Genetic bypass studies and a mutant hunt are being done to discern the nature of the kar3 meiotic arrest and to find genes involved in the checkpoint function that mediates the arrest. Checkpoints are important regulatory mechanisms used by cells to prevent aberrant cell cycle divisions such as those observed in cancerous cancerous cells. In addition Kar3p functions are thought to be mediated by interaction with a number of kinesin associated proteins (KAPs) including Cik1p and Vik1p. We have explored the roles of these KAPs in meiosis. Cik1p is essential for meiosis, while Vik1p has a very minor role. These data are consistent with Cik1p and Kar3p acting together to perform the essential role of Kar3p in meiosis. We have also localized Kar3p, Cik1p,and Vik1p during meiosis.
DTIC
Cancer; Genes; Cells (Biology); Proteins; Cell Division

20020074579 Baylor Coll. of Medicine, Houston, TX USA
Characterization of a Novel Nuclear Hormone Receptor Coactivator, Uba3, and Its Function in Breast Cancer ***Annual Report, 1 Mar. 2001-28 Feb. 2002***
Dennis, Andrew P.; Mar. 2002; 10p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-0135
Report No.(s): AD-A404882; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We have successfully developed a chromatin immunoprecipitation (ChIP) assay system, utilizing an MCF-7 cell line to investigate the involvement of Uba3 in transcription within the promoter of endogenous ER target genes. We have successfully observed recruitment of ERalpha, SRC-1, and p300 to ER binding sites within the pS2 and c-Myc promoters. During the development phase of the assay system, we expressed a GST-UBA3 fusion protein in E. coil and purified Uba3 for antibody production in rabbit. The antibody from serum was purified using full length Uba3 as an epitope to achieve pure antibody species, specifically recognizing Uba3. Western blot analysis indicates that the antibody recognizes a protein with molecular weight 66kDa in MCF-7 whole cell lysate, 1 6kDa higher than its predicted weight of 5OkDa. Uba3 is known to be covalently attached to NEDD8, and Western blot analyses of NEDD8 and Uba3 suggests that the 66kDa protein is likely to be covalently coupled NEDD8-Uba3. We are in the process of using this antibody for ChIP assay analysis. Development of a Uba3-specific antibody is essential for future work detailed in the objectives section of the original proposal.
DTIC
Antibodies; Cancer; Hormones; Mammary Glands; Receptors (Physiology); Bioassay

20020074583 Oakwood Coll., Huntsville, AL USA
Biomarkers of Genotoxicity Induced by DDT and Risk for Breast Cancer in Madison County, Alabama ***Annual Report***
Tadi-Uppala, Padma; Oct. 2001; 16p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8138
Report No.(s): AD-A404849; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Oakwood College, a private liberal arts institution, in Huntsville, Alabama in collaboration with University of Alabama in Huntsville and University of Birmingham in Huntsville is conducting a research project to study biochemical markers of genotoxicity induced by DDT in Madison County, Alabama. Residents of the town of Triana, predominantly black have been eating fish from a local river contaminated with DDT for nearly 50 years. Recently several epidemiological studies have associated DDT with breast cancer. The purpose of the study is to identify genotoxic biomarkers such as micronuclei induction, cell proliferation and to evaluate the effects of DDT on BRCA1 and BRCA2 gene products and their modulation by the soy protein genistein in rats and exposed humans. A pilot cross-sectional study was conducted among 162 Triana residents, to evaluate all

cancers combined in the overall group and breast cancer in women. The occurrence of breast cancer was significantly associated with fish consumed from the DDT contaminated ponds. (p 0.0001). of the 17 breast cancer cases or their surrogates interviewed, 4 had a family history of breast cancer. Of the remaining 13 breast cancer cases with no family history of breast cancer, 3 cases reported other hormone-related cancers (prostate, pancreas and ovary among immediate family members). Animal experiments were performed with Sprague Dawley (SD) CD rats to determine micronuclei induction and cell proliferating effects of DDT in mammary epithelial cells. Although it appears that DDT may have a promoting effect on cell proliferation, experiments need to be repeated.
DTIC
Ddt; Biochemistry; Epidemiology; Hormones; Regeneration (Physiology); Cancer

20020074588 NASA Ames Research Center, Moffett Field, CA USA
Development of Biocompatibility Procedures for Assessment of Plant Growth in Ground Test Hardware for the EMCS
Bowman, R. N., Lockheed Martin Engineering and Science Services, USA; Steele, M. K., Lockheed Martin Engineering and Science Services, USA; [2002]; 1p; In English; American Society for Gravitational and Space Biology Meeting, 6-9 Nov. 2002, Cocoa Beach, FL, USA; Sponsored by American Society for Gravitational and Space Biology, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The European Modular Cultivation System (EMCS) is an European Space Agency-developed facility designed to support plant research in microgravity on the IS NASA is responsible for providing US specific hardware to use within the EMCS. In preparation for flight, research will be developed and tested at Ames Research Center in the EMCS ground test hardware, the Experiment Reference Module (ERM) In order to determine the acceptability of the ERM for such purposes, biocompatibility tests will be performed to determine that the hardware functions as intended and successfully supports the' growth of plants. In this report, we describe the development of procedures and the collection of baseline data against which to compare ERM function, e.g. biocompatibility testing. A simple and robust system was developed to grow whole Arabidopsis thaliana plants within the confined volumes characteristic of spaceflight hardware. Our system for growing plants eliminated the necessity of a water/nutrient delivery system and allowed for quantifiable assessment of individual plants, as well as entire population dynamics. to insure uniform germination, seeds were started in small straw segments and transplanted into modified scintillation vials. Seedlings were selected prior to transplantation to decrease genetic variability. Plants were grown for a total of 24 days in standard laboratory plant growth chambers under controlled conditions. Sequential digital still images were taken on a daily basis. Analysis of these images allowed for the quantification of even minute environmental effect, on growth dynamics whole plants. The data collected provide reliable growth curves against which to compare plants grown in the ERM.
Author
Biocompatibility; Plants (Botany); Vegetation Growth; Environment Effects; Transplantation; Ground Tests

20020074590 NASA Ames Research Center, Moffett Field, CA USA
Biogeochemical Cycling
Bebout, Brad, NASA Ames Research Center, USA; Jun. 25, 2002; 1p; In English; GeoBiology Summer 2002 Field Course, 20-27 Jul. 2002, Catalina Island, CA, USA
Contract(s)/Grant(s): RTOP 344-38-00-05; No Copyright; Avail: Issuing Activity; Abstract Only

This lecture will introduce the concept of biogeochemical cycling. The roles of microbes in the cycling of nutrients, production and consumption of trace gases, and mineralization will be briefly introduced.
Author
Atmospheric Composition; Biogeochemistry; Microorganisms; Trace Elements

20020074597 NASA Ames Research Center, Moffett Field, CA USA
Gravity-Loading During Pregnancy and Birth: Effects on Neonatal Outcome
Ronca, April E., NASA Ames Research Center, USA; [1998]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

In this presentation, I will describe the effects of increased gravity on mammalian development in rodents, from gestation throughout weaning. The work is based on studies of centrifugation-induced hypergravity-rearing, the fundamentals of which will be described. The key variables include: 1) comparison of first-time (primparous) and experienced (multiparous) rodent mothers; 2) prenatal adaptation to the centrifuge; and 3) application of a modest g-load (1.5-g). The reported findings emphasize pregnancy,

labor and birth, maternal care and lactation in the dams, and suckling, growth, development, and weaning in the offspring. Pregnancy success and offspring growth and survival will be discussed.
Author
High Gravity Environments; Rodents; Pregnancy; Embryology

20020074608 NASA Ames Research Center, Moffett Field, CA USA
XCTK1: A Xenopus C-terminal Kinesin-like Protein
Winfree, Seth, NASA Ames Research Center, USA; Wilhelm, Heike, European Molecular Biology Lab., Germany; Sawyer, Alan, European Molecular Biology Lab., Germany; Karsenti, Eric, European Molecular Biology Lab., Germany; Mitchison, Tim, Harvard Medical School, USA; Walczak, Claire, Indiana Univ., USA; Reinsch, Sigrid, NASA Ames Research Center, USA; [2002]; 1p; In English; 9th International Xenopus Conference, 21-25 Aug. 2002, Cambridge, UK; No Copyright; Avail: Issuing Activity; Abstract Only

XCTK1 is 97kDa kinesin-like protein homologous to FKIF2 and KIFC3. XCTK1 is present at picomolar levels in eggs, embryos and cultured cells in a soluble high-molecular weight complex that is not associated with membranes. XCKT1 localizes to centrosomes in Xenopus A6 cells. Anti-XCTK1 antibodies also localize to spindle poles when injected into A6 cells or when added to extracts during in vitro spindle assembly reactions. XCTK1 is associated with the center of taxol-induced microtubule asters in extracts. Therefore its localization to poles is dependent on microtubule minus-ends and not on centrosomes per se. Overexpression of XCTK1 leads to centrosome destruction in cultured cells. XCTK1 was tagged at either the N- or C-terminus and transfected into Xenopus A6 cells At low expression levels, XCTK1 associated with centrosomes. At higher levels, the protein localized to insoluble cytoplasmic structures. Gamma-tubulin staining was dramatically decreased from centrosomes or altogether absent. The centrosomal SPJ antigen colocalized with XCTK1-containing structures. Upon nocodozole treatment, microtubules failed to regrow from the centrosomes indicating that overexpression of XCTK1 severely compromises centrosomal function. Current studies are aimed at determining whether XCTK1 interacts directly with centrosomal proteins and to determine the effects of XCTK1 depletion on oocyte maturation and embryogenesis.
Author
Proteins; Embryos; Membranes; Molecular Weight; Antigens; Cytoplasm

20020074611 NASA Ames Research Center, Moffett Field, CA USA
Rodent Biocompatibility Test Using the NASA Foodbar and Epoxy EP21LV
Tillman, J., Lockheed Martin Corp., USA; Steele, M., Lockheed Martin Corp., USA; Dumars, P., Lockheed Martin Corp., USA; Vasques, M., NASA Ames Research Center, USA; Girten, B., NASA Ames Research Center, USA; [2002]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Epoxy has been used successfully to affix NASA foodbars to the inner walls of the Animal Enclosure Module for past space flight experiments utilizing rodents. The epoxy used on past missions was discontinued, making it necessary to identify a new epoxy for use on the STS-108 and STS-107 missions. This experiment was designed to test the basic biocompatibility of epoxy EP21LV with male rats (Sprague Dawley) and mice (Swiss Webster) when applied to NASA foodbars. For each species, the test was conducted with a control group fed untreated foodbars and an experimental group fed foodbars applied with EP21LV. For each species, there were no group differences in animal health and no statistical differences (Pis less than 0.05) in body weights throughout the study. In mice, there was a 16% increase in heart weight in the epoxy group; this result was not found in rats. For both species, there were no statistical differences found in other organ weights measured. In rats, blood glucose levels were 15% higher and both total protein and globulin were 10% lower in the epoxy group. Statistical differences in these parameters were not found in mice. For both species, no statistical differences were found in other blood parameters tested. Food consumption was not different in rats but water consumption was significantly decreased 10 to 15% in the epoxy group. The difference in water consumption is likely due to an increased water content of the epoxy-treated foodbars. Finally, both species avoided consumption of the epoxy material. Based on the global analysis of the results, the few parameters found to be statistically different do not appear to be a physiologically relevant effect of the epoxy material, We conclude that the EP21LV epoxy is biocompatible with rodents.
Author
Biocompatibility; Epoxy Resins; Spaceborne Experiments; Rodents; Food Intake

20020074613 NASA Ames Research Center, Moffett Field, CA USA
Effects of Microgravity On Oxidative and Antioxidant Enzymes In Mouse Hindlimb Muscle
Girten, B., NASA Ames Research Center, USA; Hoopes, R., Lockheed Martin Corp., USA; Steele, M., Lockheed Martin Corp., USA; Morony, S., Amgen Pharmaceticals, USA; Bateman, T. A., BioServe Space Technologies, USA; [2002]; 1p; In English; 18th ASGSB Annual Meeting Issue, 6-9 Nov. 2002, Cape Canaveral, FL, USA; Sponsored by American Society for Gravitational and Space Biology, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Gastrocnemius muscle of mice were analyzed in order to examine the effects of 12 days of microgravity on the oxidative enzyme climate synthase (CS) and the antioxidant enzyme superoxide dismutase (SOD). The female C57BL/6J mice utilized for this study were part of the Commercial Biomedical Testing Module (CBTM) payload that flew aboard STS-108. Mice were housed in Animal Enclosure Modules (AEMs) provided by NASA Ames. The flight (FLT) group and the ground control (CON) group each had 12 mice per group. The AEMs that held the CON group operated on a 48-hour delay from the FLT group and were located inside the Orbital Environmental Simulator (OES) at Kennedy Space Center. The temperature, CO2 and relative humidity inside the OES was regulated based on downlinked information from the shuttle middeck. Student T tests were used to compare groups and a p is less than 0.05 was used to determine statistical significance. Results indicated that CS levels for the FLT group were significantly lower than the CON group while the SOD levels were significantly higher. The CS FLT mean was 19% lower and the SOD FLT mean was 17% higher than the respective CON group means. Although these findings are among the first muscle enzyme values reported for mice from a shuttle mission, these results are similar to some results previously reported for rats exposed to microgravity or hindlimb suspension. The changes seen during the CBTM payload are reflective of the deconditioning that takes place with disuse of the hindlimbs and indicate that muscle enzyme changes induced by disuse deconditioning are similar in both rodent species.
Author
Enzymes; Antioxidants; Hindlimb Suspension; Muscles; Mice; Microgravity

20020074651 NASA Ames Research Center, Moffett Field, CA USA
Insertional Mutagenesis for Genes involved in Otic/Vestibular Development and Function in Xenopus Tropicalis
Torrejon, Marcela, NASA Ames Research Center, USA; Li, Erica, NASA Ames Research Center, USA; Nguyen, Minh, NASA Ames Research Center, USA; Winfree, Seth, NASA Ames Research Center, USA; Wang, Esther, NASA Ames Research Center, USA; Reinsch, Sigrid, NASA Ames Research Center, USA; [2002]; 1p; In English; 9th International Xenopus Conference, 21-25 Aug. 2002, Cambridge, UK; No Copyright; Avail: Issuing Activity; Abstract Only

Sensitivity to gravity is essential for spatial orientation. Consequently, the gravity receptor system is one of the phylogenetically oldest sensory systems, and the special adaptations that enhance sensitivity to gravity are highly conserved. The main goal of this project is to use Xenopus (frog) to identify genes expressed during vestibular and auditory development. These studies will lead a better understanding of the molecular mechanisms involved in vestibular and auditory development and function. We are using a gene-trap approach in Xenopus tropicalis with the green fluorescent protein (GFP) gene as the transgene reporter. GFP expression occurs only when the GFP gene is correctly integrated in actively transcribed genes. Using the GFP as a tag we can easily identify and clone the mutated gene. In addition, we can study the function of the mutated gene by analyzing the defects generated by insertion of the GFP transgene. to date we have tissue specific GFP expression in X. tropicalis including expression in ear, neural tube, kidney, muscle, eyes and nose. Our transgenic animals will soon reach maturity so that we can outcross them and analyze their progeny. Our next goal is to isolate RNA from our transgenics and clone the tagged genes using RACE-PCR. Currently we are optimizing the RACE-PCR method using transgenics with crystallin GFP expression.
Author
Genes; Mutagenesis; Vestibules; Gravitation; Sensitivity

20020074780 Columbia Univ., New York, NY USA
The Functional Role of the Ataxia Telangectasia Gene ***Annual Report, 1 Sep. 1997-31 Aug. 2001***
Gautier, Jean J.; Sep. 2001; 62p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-97-1-7071
Report No.(s): AD-A405156; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Ataxia-Telangiectasia (A-T) is an autosomal recessive disease with a complex phenotype including increased risk for cancer and radiation sensitivity. Moreover, carriers are suspected to be prone to breast cancer. We have studied the role of ATM, the product of the gene mutated in A-T. We have used cell-free system derived from Xenopus eggs to obtain novel insights on the biochemical function of ATM. We have cloned the Xenopus homologue of ATM, X-ATM and generated specific antibodies to study its function. We have described X-ATM temporal expression pattern during the cell cycle as well as its spatial distribution during development. We have shown that X-ATM is present in high molecular weight complexes. We have then demonstrated the role of X-ATM in checkpoint signaling. We have reconstituted a cell-free system that recapitulates the cellular phenotype of A-T called radio-resistant DNA synthesis (RDS). We have shown that ATM is essential to signal following DNA double-strand breaks (DSBs). This ATM-dependent checkpoint leads to the inhibition of DNA replication initiation. We have also established

that DSBs can directly activate X-ATM protein kinase in cell-free extracts. Finally, we have analyzed the functional interactions between X-ATM and X-Mrell a protein essential for repair that displays a similar phenotype to A-T, when mutated.
DTIC
Genes; Ataxia; Cancer; Mammary Glands

20020074783 Center for Health Studies, Seattle, WA USA
Methods for Evaluating Mammography Imaging Techniques ***Final Report, 19 May 1997-19 Nov. 2001***
Rutter, Carolyn M.; Dec. 2001; 13p; In English
Contract(s)/Grant(s): DAMD17-97-1-7193
Report No.(s): AD-A405153; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this award is to enable Dr. Rutter to develop biostatistical methods for evaluating the accuracy of breast cancer screening. This four year program includes advanced training in the epidemiology of breast cancer, training in clinical detection of breast cancer, development of statistical methodology, and graduate teaching. A basic knowledge of the epidemiology, disease process and detection of breast cancer guides the development of statistical methods. During this third funding year, Dr. Rutter has continued to expand her knowledge of breast cancer epidemiology and detection. She has published two articles during the third funding year. The first describes bootstrap estimation of accuracy statistics when patients are assessed at multiple patient sites. The second published article compares performance of mammographers in a test setting to performance in clinical practice. Dr. Rutter also has a third article that is under review by JAMA (Journal of the American Medical Association) that compares changes in breast density among women who initiate, discontinue, and continue use of hormone replacement therapy. During her fourth funding year, Dr. Rutter will teach an introductory graduate level statistics course and will focus on methods for estimating sensitivity and specificity that incorporate growth curve models.
DTIC
Clinical Medicine; Epidemiology; Mammary Glands; Cancer; Diagnosis

20020074806 Baylor Coll. of Medicine, Houston, TX USA
Prevention of Breast Cancer Cell Transformation by Blockade of the AP-1 Transcription Factor ***Final Report, 1 Sep. 1996-30 Sep 2001***
Brown, Powel H.; Oct. 2001; 107p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-96-1-6225
Report No.(s): AD-A404992; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

We are investigating the role of AP-1 in controlling breast cell growth and transformation. We propose to determine the role of the AP-1 family of transcription factors in mediating peptide growth factor-induced proliferation and oncogene-induced transformation of breast cells. Previous results demonstrated that AP-1 complexes are activated by peptide and steroid growth factors in normal and malignant breast cells, and that normal breast cells express higher levels of AP-1 protein and activity than do breast cancer cells. We also previously showed that normal and immortal cells are more dependent on AP-1 for their growth than are most breast cancer cells. Over the last year, we determined whether AP-1 activation is required to transduce growth factor-induced signals in breast cancer cells. to perform these studies, we isolated MCF7 and MDA MB 435 clones that express a dominant-negative cJun mutant (TAM-67) under the control of an inducible promoter. These studies demonstrated that MCF7 cells, but not MDA MB 435 cells, depend on AP-1 for growth in serum. We also present results showing that inhibition of AP-i completely blocked MCF7 proliferation induced by IGF-1 and EGF, yet only partially inhibited growth induced by estrogen. These results demonstrated that the nitrogenic pathways in MCF7 cells activated by serum, estrogen, IGF-1, and EGF depend on AP-1 to transduce a proliferative signal, and that estrogen partially overcomes the growth suppressive effect of AP-1 blockade. These results suggest that AP-1 is a promising target of future cancer therapeutic and preventive agents since blocking this critical transcription factor suppresses proliferation induced by multiple growth factors.
DTIC
Cells (Biology); Prevention; Cancer; Mammary Glands

20020074807 Naval Medical Research Center, Silver Spring, MD USA
Increasing Activity of H2-Metabolizing Microbes Lowers Decompression Sickness Risk in Pigs During H2 Dives
Kayar, S. R.; Fahlman, A.; Lin, W. C.; Whitman, W. B.; Jan. 2001; 8p; In English
Report No.(s): AD-A404991; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Increasing activity of H2-metabolizing microbes lowers decompression sickness risk in pigs during H2 dives. The risk of decompression sickness (DCS) was modulated by varying the biochemical activity used to eliminate some of the hydrogen (H2) stored in the tissues of pigs (19.4 t 0.2 kg) during hyperbaric exposures to H2. Treated pigs (n = 16) received intestinal injections

of Methanobrevibacter smithii, a microbe that metabolizes H2 to water and CR4. Surgical controls (n = 10) received intestinal injections of saline and an additional control group (n = 10) was untreated. Pigs were placed in a chamber and compressed to 24 atm abs (20.6-22.9 atm H2). After 3 h the pigs were decompressed and observed for symptom of DCS for 1 h. Pigs with M. smithii had a significantly lower (P less than 0.05) incidence of DCS (44%; 7/16) than all controls (80%; 16/20). The DCS risk decreased with increasing activity of microbes injected (logistic regression P less than 0.05). Thus the supplemental tissue washout of the diluent gas by microbial metabolism was inversely correlated with DCS risk in a dose-dependent manner in this pig model.
DTIC
Decompression Sickness; Swine

20020074812 Dartmouth Coll., Hanover, NH USA
Role of BRCA1 in Estrogen Receptor Expression in Breast Cancer ***Annual Report, 1 Jan.-31 Dec. 2001***
Doherty, Kristen A.; Jan. 2002; 8p; In English
Contract(s)/Grant(s): DAMD17-99-1-9166
Report No.(s): AD-A405018; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The overall goal of our research is to investigate the correlation between BRCA1-mutated breast cancers and the Estrogen Receptor (ER)-negative phenotype. During the past year, we have focused on analysis of the CpG methylation status of the ER promoter, a proposed molecular mechanism by which sporadic ER-negative tumors lack expression of ER. We have analyzed a panel of human breast cancer cell lines and a collection of specimens from ER-negative breast cancers by two established assays. The one cell line in our panel that derived from a BRCA1 mutation carrier (HCC1937) was significantly hypomethylated, relative to the other ER-negative lines. In contrast, DNA from ER-negative BRCA1-linked breast cancers was somewhat more methylated than a parallel cohort of ER-negative non BRCA1-linked cancers, indicating that the HCC1937 line is not representative of BRCA1-derived tumors in this regard. We have recently developed a semi-quantitative sequence analysis-based method to assay a greater number of CpG sites within the ER promoter, and will apply this to our specimens.
DTIC
Receptors (Physiology); Mammary Glands; Estrogens; Cancer; Methylation; Quantitative Analysis

20020074814 University of Southern California, Los Angeles, CA USA
An Innovative Assessment of Endogenous Estrogen Activity in Persons with Different Habits of Exercise ***Annual Report, 1 Sep. 2000-31 Aug. 2001***
Hamilton, Ann s.; Sep. 2001; 18p; In English
Contract(s)/Grant(s): DAMD17-97-1-7081
Report No.(s): AD-A405015; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Evidence exists that women exercising have lower estrogen levels than sedentary women. These lower estrogen levels may be the mechanism behind their reduced breast cancer risk. Previous studies included athletes with high exercise levels, and estrogen measurements were based on a few serum samples from different times during a menstrual cycle. This study includes identical female twins who are discordant for moderate exercise. Estradiol is measured on a daily basis from saliva samples collected during a complete menstrual cycle. Procedures and questionnaires have been developed; enrollment of eligible pairs and laboratory assays are ongoing. Screening interviews have been conducted with 299 pairs. of these, 56 were initially eligible; however 10 declined to participate and 2 later became ineligible due to menopausal related reasons. Samples proved to be unusable for 3 pairs. Thus, sample collection is currently completed or underway for 39 pairs. Estradiol and progesterone assays have been completed for 29 pairs. Preliminary results, based on these pairs indicated that E2 during luteal phase was significantly higher in the inactive member of the twin pair, while follicular phase E2 was unchanged. During the no-cost extension, we will finish sample collection from about 5 more pairs of twins, complete hormonal assays including daily progesterone, incorporate dietary data in the analysis and control for confounding factors using multivariate analysis. Several publications are being planned.
DTIC
Physical Exercise; Estrogens; Physiology; Females

20020074815 Michigan Univ., Ann Arbor, MI USA
Computer-Aided Diagnosis and Feature-Guided Data Reduction Systems in Mammography ***Final Report, 23 Sep. 1996-22 Sep 2001***
Chan, Heang-Ping; Oct. 2001; 374p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-96-1-6254
Report No.(s): AD-A405030; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

We have been developing CAD algorithms in detection of microcalcifications and masses using advanced image processing and computer vision techniques. Our CAD algorithms have provided very promising results in laboratory tests. The goals in this project are to implement our CAD algorithms in a fast workstation, develop user interfaces for efficient operation of the CAD programs, and conduct a pilot clinical trial of the CAD schemes at two mammographic screening sites. Based on the results of the pilot clinical trial, we can evaluate the sensitivity and specificity of the CAD algorithms, analyze the effects of the CAD schemes on manmographic screening, identity potential problems in a clinical environment, and develop methods to further improve the CAD schemes in the future. We believe that this is a crucial step to develop a clinically practical CAD workstation.
DTIC
Diagnosis; Mammary Glands; Cancer

20020074817 Virginia Commonwealth Univ., Richmond, VA USA
Bio-Hemostat-Acute Treatment Modality for High Pressure Hemorrhage ***Annual Report, 1 Apr. 2001-31 Mar. 2002***
Carr, Marcus E., Jr; Apr. 2002; 15p; In English
Contract(s)/Grant(s): DAMD17-01-1-0691
Report No.(s): AD-A405035; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Bleeding from an artery is difficult to control due to the high pressures found in the arterial system. Hemorrhage is especially problematic in penetrating wounds where the bleeding source may not be apparent. Tourniquets that are routinely used to treat such wounds can cause multiple complications. We are developing a device which, when exposed to aqueous solutions, rapidly generates pressure in a confined space. In this report, we summarize the design and testing of a prototype device. The ”biohemostat” is composed of a flexible outer membrane, which surrounds a hydrophilic, super-absorbent polymer. The outer bag is made from an electrospun mat of Ethylene-vinyl acetate copolymer. The electrospun mat is very flexible, durable (stretching to 10 times its original length), biocompatible and porous. Its relative degree of hydrophobisity is overcome by incorporating a percentage of EVOll either as a blend or composite. The hydrophilic polymer used in the prototype device is composed of polyacrylic acid derivatives or copolymers. When the device is placed in aqueous solutions it rapidly absorbs fluid, expands and develops significant pressure in a confined space. Although swelling of such polymers is dependent on the nature of the aqueous solution (i.e. Varies with pH, ionic strength, protein content, etc.) the decreases in absorption caused by these parameters have been easily overcome by increasing the amount of hydrophilic polymer. The goal is to develop a device, which can be placed directly into a wound to develop counter pressure to aid in hemorrhage control. by developing pressure directly on the bleeding site, the hope is to avoid the crush injuries and ischemic damage associated with tourniquet use.
DTIC
Hemorrhages; Medical Equipment; Pressure Reduction; Membrane Structures

20020074821 California Univ., Berkeley, CA USA
A Cell Culture Model for Understanding Estrogen Receptor Regulation in Normal and Malignant Cells. Addendum ***Annual Report, 30 Sep. 2000-29 Sep 2001***
Novaro, Virgina; Bissell, Mine; Oct. 2001; 6p; In English
Report No.(s): AD-A405045; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

One of the major obstacles to study the contribution of estrogen receptor (ER) to the initiation and progression of breast cancer is the lack of an appropriate culture model that duplicates the estrogenic effects seen in the normal gland in vivo. We postulate that the correct expression and function of ER depends on an appropriate microenvironment that preserves cell-cell and cell-matrix interactions. Here we determined that the extracellular matrix (ECM) modulates the expression and function of the ER. The stimulation of the ER-mediated response by the presence of cell-matrix interactions involves the a6 integrin subunit. Using quantitative RT-PCR and western blots we also demonstrated that both normal and tumorigenic mouse mammary cell lines in culture increased ERa expression levels in response to ECM and that those levels are higher in the tumorigenic cell line. Moreover, the presence of estradiol decreased the expression of its own receptor in both cell types, two-fold in normal cells and fifteen-fold in tumorigenic cells. Therefore, we believe that the regulatory effect of ECM is exerted, at least in part, by modulating both the ER-mediated response and/or ERa levels itself. In addition, we have developed an in vitro culture system for mouse mammary cells isolated from the gland, which partly prevents the loss of ERa expression normally seen in standard culture conditions. This improved technique relies on culturing the cells in 3D cultures inside collagen I gels or on top of Matrigel instead of 2D monolayers, and the addition of lactogenic hormones. These results suggest that the approach that we have chosen to analyze the regulation of ER function by a three-dimensional matrix is promising. The regulation of ER by ECM could be a crucial step in

the progression of breast cancer from an ER-positive to an ER-negative tumor, which leads to a hormone-independent and more aggressive cancer phenotype. In addition, manipulating ER expression in mammary cells b7
DTIC
Estrogens; Cancer; Culture Techniques; Cells (Biology); Mammary Glands; Stimulation

20020074830 Georgetown Univ., Washington, DC USA
A New APC-Like Gene Involved in Regulation of B-Catenin/LEF ***Annual Report, 1 Jul. 2000-30 Jun. 2001***
Jarrett, Christy R.; Jul. 2001; 53p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-99-1-9197
Report No.(s): AD-A404820; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A second adenomatous polyposis coli (APC)-like gene, APC2/APCL was recently described and localized to chromosome 19. We have fine mapped APC2 to a small region of chromosome 19p13.3 containing markers D19S883 and WI-I 9632, a region commonly lost in a variety of cancers, particularly ovarian cancer. Interphase FISH analysis revealed an APC2 allelic imbalance in 19 of 20 ovarian cancers screened and indicates that APC2 could be a potential tumor suppressor gene in ovarian cancer. When over-expressed in SKOV3 ovarian cancer cells, which express low levels of APC2, exogenous APC2 localized to the Golgi apparatus, actin-containing structures, and occasionally to microtubules. Antibodies against the N-terminus of human APC2 show that endogenous APC2 is diffusely distributed in the cytoplasm and co-localizes with both the Golgi apparatus and actin filaments. APC2 remained associated with actin filaments following treatment with the actin-disrupting agent, cytochalasin D. These results suggest that APC2 is involved in actin associated events and could influence cell motility or adhesion through interaction with actin filaments as well as functioning independently or in cooperation with APC to down-regulate beta-catenin signaling.
DTIC
Genes; Cancer; Mammary Glands

20020074831 Army Medical Dept. Center and School, Fort Sam Houston, TX USA
US Army Medical Department Journal ***Quarterly Report, Jul.-Sep. 2002***
Nelson, Bruce; Sep. 2002; 61p; In English
Report No.(s): AD-A404812; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Clinical and nonclinical professional information designed to keep U.S. Army Medical Department personnel informed of health care, research, and combat and doctrine development information.
DTIC
Medical Services; Medical Personnel; Armed Forces (USA)

20020074839 Cornell Univ., Medical College, USA
Neutral Endopeptidase Inhibits Neuropeptide Medicated Growth of Androgen-Independent Prostate Cancer ***Annual Report***
Iwase, Akira; Sep. 2001; 10p; In English
Report No.(s): AD-A404915; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Prostate cancer is the most common primary cancer among men and the second leading cause of cancer deaths in males in the USA. While withdrawal of male hormones is the primary treatment for patients who develop advanced disease, most patients will show evidence of disease progression within 2 years. Secondary therapies are unsuccessful once tumors become hormone refractory, and most patients will die of their disease within 12 months resulting in 37,000 anticipated deaths in 1999. Understanding the mechanisms involved in the development of hormone resistance is crucial to developing therapies to treat hormone-refractory prostate cancer. We propose that growth of hormone-refractory prostate cancer is aided in part by the decreased presence of a cell surface enzyme, neutral endopeptidase, which normally functions to inactive growth factors which stimulate the prostate cancer cells to grow. The aim of this project is to delineate the role of neutral endopeptidase in regulating the growth of hormone refractory prostate cancer, and to define the mechanisms by which neutral endopeptidase can inhibit prostate cancer growth. Understanding the involvement of NEP in the progression to hormone refractory prostate cancer and in inhibiting prostate cancer growth will lead to the development of a clinical strategy for the use of neutral endopeptidase as therapy to treat this disease.
DTIC
Cancer; Prostate Gland; Hormones

20020074840 City of Hope Medical Center, Beckman Research Inst., Duarte, CA USA
Metal Ion Complexes for Antibody Imaging and Therapy in Breast Cancer ***Final Report, 1 Aug. 1998-28 Feb. 2002***
Shively, John E.; Mar. 2002; 29p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-98-1-8031
Report No.(s): AD-A404911; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals of this project were to prepare and test novel bifunctional chelates based on DOTA to anti-CEA and anti-her2/neu antibodies. The conjugates were labeled with In-111 for imaging and Y-90 for therapy. Two tumor xenograft models were tested: MCF7 cell transfected with her2/neu for over-expression of her2/neu, and MCF7 cell expressing 'normal' amounts of her2/neu. Both cell lines also express CEA. We showed that both models had good uptake of In-111 labeled antibodies and responded to Y-90 labeled RIT. The RIT response was further improved by the combined administration of taxol and RIT. Novel peptide-DOTA conjugates to recombinant antibody fragments were prepared, radiolabeled with In-111, and shown to reduce normal kidney uptake compared to DOTA directly conjugated to the same antibody fragments. This work demonstrates that breast cancers can be treated with both anti-her2/neu and anti-CEA antibodies, and that recombinant antibody fragments can be used for imaging or therapy with the novel peptide linker chelators.
DTIC
Antibodies; Radiation Therapy; Chelates; Cancer; Mammary Glands

20020074841 Rand Graduate Inst. for Policies Study, Santa Monica, CA USA
What is the Quality of Care in a Developing Country: Measuring Physician Practice and Health Outcomes
Munoz, Jorge A.; Jan. 2002; 182p; In English
Report No.(s): AD-A404923; RAND/RGSD-163; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The objectives of this dissertation are to provide a better understanding on how to measure the quality of health care in a less developed country in an effort to furnish an instrument for improving clinical care and national health policy formulation. The audience of this work thus includes health care practitioners as well as policymakers. to accomplish the stated objectives, this research will initially analyze the relationship between structural measures of quality with the clinical knowledge (process) of physicians. Subsequently, we will analyze the impact of clinical knowledge, and by association, clinical practice of primary health providers on the health status of a population. Improving health care requires skillful practitioners to selectively use their knowledge, medical expertise, and medical technologies. The combination of what providers do and what they have to work with are the basic inputs that are expected to result in better health. when better health does not result, however, the responsibility is often assigned to the lack of material inputs. This is particularly true in developing countries where clinical facilities and medicine are obviously lacking. and while material inputs could be wanting, poor clinical practice could be an even more important explanation
DTIC
Medical Services; Clinical Medicine; Developing Nations

20020074844 University of Southern California, Los Angeles, CA USA
Improving Detection of Axillary Lymph Nodes by Computer-Aided Kinetic Feature Identification in Positron Emission Tomography ***Annual Report, 1 Aug. 2000-31 Jul. 2001***
Yu, Xiaoli; Aug. 2001; 101p; In English; Original contains color images
Contract(s)/Grant(s): DAMD17-00-1-9379
Report No.(s): AD-A404943; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The goal of this project is to improve detection of metastatic axillary breast cancer through sophisticated physiological modeling and statistical signal processing techniques. The major focus of Year 2 was to develop statistical hypothesis test criteria for the computer-aided detection of kinetic features in metastases, which was built on modeling, extracting and exploiting physiological features pursued since the last reporting period. Three types of generalized likelihood ratio tests (GLRT) were derived under different assumptions on pixel spatial correlation. We compared these three GLRTs using three different methods of TAC evaluation and computer generated phantom data. The lesions in the phantom data were fully invisible. The results show that the best of the three achieved 97%, 79% and 88% for specificity, sensitivity and accuracy, respectively. Further work on validation and evaluation of physiological feature modeling, kinetic parameter estimation and objective rank-reduction of dynamic PET sinogram for fast image reconstruction has also been continued through this year. The results of the initial clinical dataset studied are promising, but too small to make a conclusive decision. The assessment of all findings in theory and simulations in Year 1 and Year 2 will be continued in the Year 3 when more clinical data will be available.
DTIC
Detection; Lymphatic System; Cancer; Mammary Glands; Computer Aided Tomography

20020074847 NASA Marshall Space Flight Center, George C Marshall Space Flight Center, Huntsville, AL USA

Cell and Molecular Biology of Ataxia Telangiectasia Heterozygous Human Mammary Epithelial Cells Irradiated in Culture ***Annual Report, 1 Sep. 2000-31 Aug. 2001***

Richmond, Robert C., NASA Marshall Space Flight Center, USA; Sep. 2001; 7p; In English

Contract(s)/Grant(s): DAMD17-99-IA-9382

Report No.(s): AD-A403375; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Autologous isolates of cell types from obligate heterozygotes with the autosomal disorder ataxia-telangiectasia (A-T)were used to begin a tissue culture model for assessing pathways of radiation-induced cancer formation in this target tissue. This was done by establishing cultures of stromal fibroblasts and long-term growth human mammary epithelial cells (HMEC) in standard 2-dimensional tissue culture in order to establish expression of markers detailing early steps of carcinogenesis. The presumptive breast cancer susceptibility of A-T heterozygotes as a sequel to damage caused by ionizing radiation provided reason to study expression of markers in irradiated HMEC. Findings from our study with HMEC have included determination of differences in specific protein expression amongst growth phase (e.g., log vs stationary) and growth progression (e.g., pass 7 vs pass 9), as well as differences in morphologic markers within populations of irradiated HMEC (e.g., development of multinucleated cells).

DTIC

Genetics; Epidermis; Ataxia; Cancer; Cells (Biology); Carcinogens

20020074876 California Univ., Dept. of Chemical Engineering, Berkeley, CA USA

Strategies for Metabolic Engineering of Environmental Microorganisms-Application to Degradation of Organophosphate Contaminants ***Final Report, 30 Nov. 1998-29 Nov 2001***

Keasling, Jay D.; Jul. 30, 2002; 5p; In English

Contract(s)/Grant(s): N00014-99-1-0182

Report No.(s): AD-A405157; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goal of this work was to develop the experimental and theoretical methods to introduce multiple, heterologous, biodegradation pathways into a single organism and to optimize the flux through those pathways for the remediation of toxic or recalcitrant organic contaminants. Specifically, we found and cloned a gene that encodes an enzyme capable of degrading diethylphosphate, cloned and expressed a pathway for complete mineralization of p-nitrophenol phosphate, cloned and expressed a phosphotriesterase capable of hydrolyzing parathion, developed a co-culture biofilm capable of degrading ding parathion (as a proof-of-concept), and combined all of the genes in a single organism for complete mineralization of parathion of paraoxon.

DTIC

Metabolism; Contaminants; Biodegradation; Phosphates; Microorganisms; Bioengineering; Biofilms

20020074877 Michigan Univ., Ann Arbor, MI USA

A Developmental Approach to Characterizing the Tissue-Invasion Gene Program in Breast Cancer ***Final Report, 11 Aug. 1997-10 Aug 2001***

Weiss, Stephen J.; Sep. 2001; 24p; In English

Contract(s)/Grant(s): DAMD17-97-1-7282

Report No.(s): AD-A405158; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The changes in the gene program of neoplastic cells that regulate the expression of an invasive phenotype are largely undefined. Direct comparisons of the gene expression profile displayed in normal and carcinomatous breast tissues have provided insights into the mechanisms underlying tumor progression. However, attempts to identify the gene products differentially expressed during invasion in vivo have been hampered by the fact that only a small percentage of the cells recovered from a tumor mass are actively engaged in invasive behavior at the time of isolation. Because tissue remodeling induced during mammary gland involution bears homology to early stages of carcinogenesis, the involuting mammary gland may be used to identify genes that control matrix turnover in cancerous states. to this end, we propose to i) screen involuting versus resting mouse mammary glands by oligonucleotide microarray for differentially expressed gene products associated with matrix remodeling, ii) evaluate potential role of differentially expressed gene products in regulating cell invasion in vitro and/or in vivo and iii) evaluate role of differentially expressed gene products in regulating breast cancer cell invasion.

DTIC

Genes; Cancer; Mammary Glands; Genetics

20020074905 Midwest Research Inst., Kansas City, MO USA

Autonomic Dysfunction in Gulf War Veterans ***Annual Report, 31 Jan. 2001-30 Jan 2002***

Sastre, Antonio; Cook, Mary R.; Feb. 2002; 36p; In English

Contract(s)/Grant(s): DAMD17-00-C-0018

Report No.(s): AD-A405043; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

For military personnel, the sequellae of war include the immediate dangers of combat and the potential for long-term medical and psychological disability. Factors such as fatigue, hunger, lack of sleep, and exposure to weather extremes combine to present the soldier with cumulative physical stress, and with the physiological stress that is an unavoidable consequence of physical stress. The valid fear of dying or of being wounded and the emotional effects of seeing others injured or dead, combine with physical stressors to define the actualities of past and present day battlefield experience I 2345 for many men and women. Reports indicate that the overwhelming majority of soldiers experience fear during or before battle with physical symptoms that have been well-documented. Over time, prolonged exposure to such combined physical and psychological stressors can result in individual exhaustion and decreased combat effectiveness.

DTIC

Stress (Psychology); Human Performance; Psychological Effects; Fear; Warfare; Military Psychology; Personnel

20020074985 Naval Medical Research and Development Command, Bethesda, MD USA

Recombinant Antibodies for Biological Warfare Detection ***Final Report, 1 Oct. 1996-30 Sep. 2000***

Dim-Schultz, Amanda; Gebhardt, Joan S.; Aug. 13, 2002; 3p; In English

Contract(s)/Grant(s): B0001499AF00001

Report No.(s): AD-A404874; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Recombinant antibodies to biological warfare threat agents including F. tularensis, Y. pestis, Brucella spp., V. cholerae O1 and O139, ricin, staphylococcal enterotoxins B and C, botulinum toxins A, B, and E and cholera toxin have been developed through the use of phage display technology. Both recombinant scFvs and Fabs have been produced. Substitutions of currently available monoclonal antibodies with these recombinant antibodies in immunological based detection systems have been successful. The recombinant antibodies exhibited equal sensitivity and equal or lower background across a number of platforms including ELISA assays, ECL based platforms and hand-held immunochromatographic assays. In addition, incorporation of the recombinant antibodies into current detection systems provides a stable genetic source for maintaining critical immunological reagents. The use of recombinant antibodies has allowed for improved detection and identification of biological warfare agents.

DTIC

Antibodies; Cholera; Biological Effects; Biological Weapons

20020074986 Army Medical Research and Development Command, Fort Detrick, MD USA

The p27Kip1 Tumor Suppressor and Multi-Step Tumorigenesis ***Final Report, 1 Aug. 1998-31 Jul. 2001***

Clurman, Bruce E.; Aug. 2001; 33p; In English

Contract(s)/Grant(s): DAMD17-98-1-8306

Report No.(s): AD-A404870; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mutations in genes that regulate the cell cycle are the most common genetic changes in cancer cells. p27kip1 is a member of the Cip/Kip family of cyclin-dependent kinase inhibitors. Decreased p27 expression is found in a wide variety of human neoplasms and is associated with poor patient outcome in many human cancers. Although these studies of p27 expression in primary tumors have correlated low p27 expression with poor prognosis, they do not demonstrate that p27 loss is a causal step in tumorigenesis. In mice however, p27 functions as a tumor suppressor that exhibits haplo-insufficiency. The goal of this research was to investigate the role of p27 in tumorigenesis by characterizing mechanisms of p27-associated tumorigenesis, and identifying proteins that cooperate with p27-loss during tumorigenesis. Using insertional mutagenesis, we identified several novel and previously known oncogenes that cooperate with p27-loss during lymphomagenesis. We also examined the interaction of p27-loss with mutations within the Wnt pathway in mice, but failed to observe synergy during mammary carcinogenesis. Finally, we specifically investigated the hypothesis that p27 and p130, a member of the Retinoblastoma protein family, cooperate in tumor suppression. However, our studies did not reveal cooperativity between these two proteins with respect to tumorigenesis.

DTIC

Cancer; Carcinogens; Mammary Glands; Mutagenesis; Neoplasms

20020074993 Office of the Surgeon General (Navy), Arlington, VA USA

Medical Operational Requirements in Support of the OPLAN ***Final Report***

Levy, Robert A.; Miller, Richard D.; Mar. 1998; 44p; In English

Contract(s)/Grant(s): N00014-00-D-0700; Proj-R0148

Report No.(s): AD-A405000; CAB-97-118; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Director, Medical Resources, Plans and Policy Division asked CNA to determine the capabilities and limitations of the primary Casualty Receiving and Treatment Ships (CRTSs) and Hospital Ships (T-AHs) and how they will be used in support of OPLAN (Operations Plan). The analysis calculates the requirements for medical personnel and compares them with the platform's capabilities. It finds that, given the base set of casualties, the CRTS treaters would not be stressed. On the hospital ship, however, many subspecialists will experience stress the first few days, especially on the first day that casualties arrive.

DTIC

Medical Services; Military Operations; Medical Personnel; Stress (Psychology); Human Performance

20020075007 Thomas Jefferson Univ., Philadelphia, PA USA

Contrast Enhanced 3D Color Amplitude Imaging of the Breasts ***Final Report, 15 Sep. 1997-14 Sep 2001***

Forsberg, Flemming; Oct. 2001; 40p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-97-1-7116

Report No.(s): AD-A405180; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In total, 55 patients with 16 cancers and 39 benign lesions were enrolled in the study, which was less than anticipated. Standard 2D ultrasound achieved a sensitivity of 73% and a specificity of 58%, while 3D produced 75% and 36%, respectively. Contrast increased 3D sensitivity to 88% and specificity to 47%. The area under the ROC curve for the detection of breast cancer was 0.55 for 2D contrast, 0.60 for 3D ultrasound and 0.76 for 3D CAI with contrast (p less than 0.03) . Mammography produced an area of 0.86, which was significantly higher than all ultrasound modalities (p less than 0.025) except 3D contrast (p=0.16). When mammography was combined with 2D contrast the area increased to 0.88, with 3D contrast to 0. 89, and with all ultrasound modalities to 0.96 (p less than 0.001) . The vascularity and the presence of anastamoses observed with 3D contrast were the only significant markers of malignancy found (p less than 0.02). In a subset of 17 patients, 2D contrast provided some quantitative parameters, which correlated with direct pathologic vascularity assessments such as the iMVD. Specifically, the microvessel area and density for vessels 30 to 39 micrometers in diameter were most significant. Overall these results validate the fundamental hypothesis of this project; namely that the combination of 3D CAI and an ultrasound contrast agent increases the ability to diagnose breast cancer relative to current techniques.

DTIC

Ultrasonics; X Ray Optics; Mammary Glands; Cancer

20020075008 Massachusetts General Hospital, Boston, MA USA

MHC Genes and Breast Cancer ***Final Report, 15 Aug. 1997-14 Aug 2001***

Pillai, Shiv S.; Sep. 2001; 15p; In English

Contract(s)/Grant(s): DAMD17-97-1-7303

Report No.(s): AD-A405179; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We wished to ascertain whether the failure to inherit putative protective alleles of HLA class II genes is linked to the development of breast cancer. We molecularly typed HLA DPB1, DQB1, DRB1 and DRB3 alleles in 176 Caucasian women diagnosed with early onset breast cancer, and in 215 ethnically matched controls. HLA DQB*03032 was identified in 7% of controls but in no patients with early onset breast cancer (p = 0.0001). HLA DRB1*11 alleles were also significantly overrepresented (p less than 0.0001) in controls (16.3%) as compared with patients with early onset breast cancer (3.5%). HLA DQB*03032 and HLA DRB 1*11 alleles may have a protective role in human breast cancer. We have identified a protein expressed at very low levels during development and which is expressed at very high levels in a proportion of breast tumors, and may therefore represent a relevant antigen. This protein, a kinase called PKK, was cloned in our laboratory and has been shown to functionally connected to a kinase downstream of the EGF receptor, suggesting that high level PKK expression may be relevant to breast tumorigenesis. In unpublished studies by another group, this protein was identified by screening expression libraries using sera from breast cancer patients.

DTIC

Genes; Cancer; Mammary Glands

20020075010 Illinois Univ., Broad of Trustees, Chicago, IL USA

The Social Construction of Breast Cancer in Mass Media and Its Influence on Public Understanding and Citizen Decision-Making ***Final Report, 15 Sep. 1997-14 Sep 2001***

Poirier, Suzanne; Oct. 2001; 31p; In English; Original contains color images

Contract(s)/Grant(s): DAMD17-97-1-7240

Report No.(s): AD-A405199; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study has been and continues to be an assessment of the ways in which mass media play a significant role in constructing the public's understanding of breast cancer as a social problem, a disease, and personal illness experience. This fourth annual and final report primarily summarizes work conducted as a result of a one-year extension of remaining grant funds. This portion of the study focuses on a case study of a viewing season of the situation comedy, Murphy Brown, during which the lead character was portrayed as being diagnosed and treated with breast cancer, while coping with demands of daily living including work, friendships, and parenting. This case is an exemplar of the simultaneous attempts to use entertainment television for the pro-social objective of raising awareness and extending understanding about this disease, as well as appropriating the dramatic aspects of this same life-threatening disease for entertainment purposes. of special interest is the use of comedy to communicate serious information and, often poignant, issues.

DTIC

Cancer; Mammary Glands; Information

20020075011 Wayne State Univ., Detroit, MI USA

Soy Metabolites, Isoflavones in Cell Growth and Apoptosis ***Final Report, 13 Jun. 1997-13 Dec. 2001***

Sarkar, Fazlol; Jan. 2002; 14p; In English

Contract(s)/Grant(s): DAMD17-97-1-7328

Report No.(s): AD-A405198; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of our investigation was to elucidate the molecular mechanism(s) by which genistein elicits its biological effects on non-tumorigenic and tumorigenic breast epithelial cells. We have completed all our tasks as planned and our major findings are: (a) that genistein inhibits cell cycle by modulating genes that are important cell cycle regulators, (b) that genistein induces apoptotic cell death in breast cancer cells irrespective of their status of estrogen receptor positivity, (c) that genistein elicits differential effects between non-tumorigenic and tumorigenic breast epithelial cells, and (d) that genistein also down regulate NF-kB in breast epithelial cells and that this effect of genistein may be due to down regulation of Akt signaling (this aspect is currently being pursued in a pending grant application to the Department of Defense).

DTIC

Metabolites; Mammary Glands; Cancer

20020075013 Duke Univ., Medical Center, Durham, NC USA

Corepressor Associated Peptides (CAPs): Tools to Elucidate the Role of Corepressors as Regulators of Progesterone Receptor Transcriptional Activity ***Annual Report, 1 Mar. 2000-28 Feb. 2002***

Xiaolin, Li; McDonnell, Donald; Mar. 2002; 31p; In English

Contract(s)/Grant(s): DAMD17-00-1-0234

Report No.(s): AD-A405217; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The major goal of this research is to study the mechanism of corepressor proteins N-CoR in normal and breast cancer cells. It has been shown that N-CoR is capable of association with antagonist-bound estrogen receptor in the hormone-dependent human breast cancer. In addition, it has been shown that in the tamoxifen resistant breast cancer cells N-CoR expression level is decreased. These observations highlight N-CoR as key regulators of breast cancer pharmacology. During the course of our research sponsored the current Postdoctoral Traineeship, we investigated N-CoR functions by identification of new N-CoR binding proteins and new mechanism that regulate N-CoR activities. The major findings are summarized as follows. First, we discovered that N-CoR physically interacts with B-Myb, a key cell cycle regulator. The significance of these B-Myb-corepressor interactions was confirmed by the finding that B-Myb mutants, which were unable to bind N-CoR, exhibited constitutive transcriptional activity. We also have determined that phosphorylation by cdk2/cyclin A blocks the interaction between B-Myb and N-CoR and that mutation of the corepressor binding site within B-Myb bypasses the requirement for this phosphorylation event. In our second finding, we discovered that corepressor N-CoR directly interacts with coactivator ACTR. Interestingly, ACTR is over-amplified in a number of breast cancer cells. We observed that N-CoR contributes to transcriptional activation by recruiting ACTR to nuclear

receptors prior to ligand activation. Our results suggested that transcriptional repression and activation, the two processes which both involved in breast cancer biology, are integrated in a manner that are not previously anticipated.
DTIC
Peptides; Cancer; Mammary Glands; Transcription (Genetics)

20020075016 Johns Hopkins Univ., Baltimore, MD USA
DNA Repair and Breast Cancer Risk ***Final Report, 1 Oct. 1997-30 Sep. 2001***
Helzlsouer, Kathy J.; Oct. 2001; 16p; In English
Report No.(s): AD-A405181; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Investigations of potential gene-environment interactions may improve our understanding of the etiology of breast cancer, a disease where less than 40% of cases can be attributed to known risk factors. The objectives of this proposal are to examine the association between DNA repair proficiency and breast cancer risk, and the contribution of this factor to the familial clustering of breast cancer. We hypothesize that mechanisms leading to suboptimal repair of DNA damage are susceptibility factors predisposing women to breast cancer through increased sensitivity to carcinogenic damage from environmental exposures such as ionizing radiation. to evaluate this hypothesis a case-control study was conducted. Women with a personal history of breast cancer and women at increased breast cancer risk are being compared to control women for the presence of Lys/ Lys 751 EPPPD genotype. We observed a strong association between presence of the Lys/Lys 751 XPD genotype and higher number of chromatid aberrations. Thus, we are assessing the XPD genotype, in place of the DNA repair proficiency cytogenetic assay which we originally planned to do. We will also evaluate the possible interaction between Lys/Lys 751 XPD genotype and ionizing radiation exposure, by stratifying the case-control data on exposure status, and assessing the relation between breast cancer risk and the genotype. Delay introduced by difficulties in assay development caused us to run out of time and funds before we could complete recruitment to a planned family study.
DTIC
Deoxyribonucleic Acid; Cancer; Mammary Glands

20020075019 Fox Chase Cancer Center, Philadelphia, PA USA
Human Breast Cancer and Alterations in Methylthioadenosine Phosphorylase ***Final Report, 15 May 1997-14 May 2002***
Kruger, Warren D.; Jun. 2002; 15p; In English
Contract(s)/Grant(s): DAMD17-97-1-7077
Report No.(s): AD-A405174; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Methylthioadenosine phosphorylase (MTAP) is a key enzyme in the conversion of methylthloadenosine (MTA) into methionine and adenine. The MTAP gene is frequently deleted in a variety of different cancers. Our lab has found a link between loss of MTAP and the phenomena of methionine dependent growth, defined as the inability to grow on media containing methionine's metabolic precursor homocysteine. Cells lacking MTAP have increased sensitivity to purine biosynthetic inhibitors such as methotrexate and 5,10-dideazatetrahydrofolate. These observations suggest that an effective two-pronged strategy could be used to eliminate MTAP negative breast cancer cells in vivo. We have created two isogenic breast cancer derived cell lines, one that is MTAP+ and the other that is MTAP-. The MTAP expressing line can use MTA to make methionine, but is still unable to grow on media lacking homocysteine. This result suggests that MTAP deletion is not the primary cause of methionine dependent growth. Our MTAP deleted cells have increased sensitivity to growth in low levels of methionine and are more sensitive to drugs that inhibit purine biosynthesis. These results suggest that these treatments may be useful in treating MTAP deficient cancers in vivo.
DTIC
Enzymes; Genes; Cancer; Mammary Glands; Adenosines

20020075020 Mount Sinai School of Medicine, New York, NY USA
Mechanisms of Breast Carcinogenesis Involving Wild-Type p53 ***Final Report, 1 Aug. 1997-1 Aug 2001***
Manfredi, James; Sep. 2001; 49p; In English; Original contains color images
Report No.(s): AD-A405173; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Genetic alteration of p53 resulting in loss-of-function is a common event in many human cancers. In contrast, the majority of human breast carcinomas express a wild-type p53 protein. p53 is a transcription factor which exerts its effects by regulating the expression of particular target genes. Alterations in the expression of factors that regulate p53-dependent transcription may contribute to breast carcinogenesis in which the p53 itself is wild-type. As an approach to identify such factors, three

p53-dependent target genes have been identified in which additional sequence elements besides p53 binding sites are involved in the transcriptional response to p53.
DTIC
Cancer; Mammary Glands

20020075024 Wisconsin Univ., Madison, WI USA
Genetics of Bone Mineralization and Morphology in Inbred Mice: Analysis of the HcB/Dem Recombinant Congenic Strains ***Annual Report, 1 Apr. 2001-31 Mar. 2002***
Blank, Robert D.; Apr. 2002; 45p; In English
Contract(s)/Grant(s): DAMD17-00-1-0071
Report No.(s): AD-A405184; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Susceptibility to osteoporotic fractures varies widely with genetic factors accounting for 50% of this variation. Fracture risk is determined by peak bone mass and skeletal morphology achieved in young adulthood and the rate and extent of bone loss thereafter. This work will analyze the genetics of the first of these components through the use of recombinant congenic mice. We have demonstrated that the 27 HcB/Dem strains differ significantly in a variety of bone strength related phenotypes at 6 months of age. Further, preliminary mapping of genetic loci contributing to these phenotypes has been carried out. An intercross between HcB/13 and HcB/14 will allow more accurate mapping of a subset of these bone strength genes and investigation into pairwise epistatic interactions among loci. A cross examining Cola2(sup oim)/+ heterozygotes will allow determination of whether segregating differential loci in this system map to the same chromosomal regions identified in the HeB/Dem studies. Further breeding will be performed to develop true congenic lines and refine the mapping of the candidate genes for their positional cloning. Identifying mouse chromosome regions that control peak bone mineralization and morphology will allow prediction of the corresponding human regions by synteny and facilitate human genetic studies of this problem.
DTIC
Genetics; Osteoporosis

20020075044 Texas Univ., Southwestern Medical Ctr., Dallas, TX USA
Mevalonates, Ras and Breast Cancer ***Final Report, 1 Sep. 1997-31 Aug. 2001***
White, Michael A.; Sep. 2001; 11p; In English; Original contains color images
Report No.(s): AD-A405165; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Therapy of any cancer is designed to control growth of cancer cells while permitting the function and proliferation of normal cells. 6-fluoromevalonate (Fmev) can inhibit proliferation of leukemic cells lines while not affecting normal lymphocytes. This selective inhibition appears to be a consequence of expression of oncogenic Ras. Here we are evaluating the ability of Fmev to selectively interfere with proliferation of breast cancer cells. We have shown that Fmev can inhibit the proliferation of normal breast epithelial cells. However the proliferation of some, but not all, transformed breast epithelial cell lines expressing oncogenic Ras is inhibited by concentrations of Fmev that do not affect normal breast epithelia. Our study of the contribution of oncogenic Ras to this sensitization, suggests that it is an indirect mechanism involving reduced adherence to substrate. In addition, while growth of RAS transformed cells on plastic is inhibited by Fmev, growth in suspension is not. Our results do not support pursuing Fmev as an effective therapy against Ras transformed breast epithelia.
DTIC
Cancer; Mammary Glands; Therapy; Epithelium

20020075046 Georgetown Univ., Washington, DC USA
Testing Grb2 as a Target for Cancer Therapy ***Final Report, 1 Aug. 1998-31 Jul. 2001***
Yang, Dajun; Aug. 2001; 29p; In English
Contract(s)/Grant(s): DAMD17-98-1-8091
Report No.(s): AD-A405163; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In breast cancers with erbB-2 overexpression abnormal cell proliferation is caused by the extremely active tyrosine kinase activity and resulting high level of signal transduction. An early and important intermediate in this signalling is the adaptor protein Grb2. This application proposed to design and test novel Grb2 inhibitors. This analysis will have important implications for translational cancer research by testing Grb2 inhibition as a target for therapy using compounds of defined biochemical activity. The support from USAMRMC (US Army Medical Research and Materiel Command) for the peptide based studies has led to development of modified peptidomimetics and small molecule inhibitors and successful funding from the Komen Foundation for Breast Cancer Research. The results from the peptide Grb2 inhibitors study provided an important proof-of-concept for an approach that may generate specific, potent SH2 antagonists as clinical candidates in the near future. This type of SH2 antagonists

might have a better therapeutic potential to be used either by themselves or in combination with other conventional chemotherapeutics in the treatment of breast cancer.
DTIC
Cancer; Mammary Glands; Gene Expression; Therapy

20020075710 Oklahoma Medical Research Foundation, Oklahoma City, OK USA
The Role of Id Proteins in Breast Cancer ***Final Report, 1 May 1998-30 Nov. 2001***
Xiao-Hong, Sun; Nov. 2001; 25p; In English
Contract(s)/Grant(s): DAMD17098-1-8135
Report No.(s): AD-A404876; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

E2A gene products (E47 and E12) are potent transcription factors containing the basic helix-loop-helix (bHLH) domain for DNA binding and dimerization. E2A proteins are thought to control cell growth and differentiation. E2A is also implicated to have a role as a tumor suppressor. E2A function can be inhibited by a group of inhibitors called Id. Thus, overexpression of Id proteins could diminish the function of E2A as a tumor suppressor, and potentially cause breast cancer. to test this hypothesis, we have generated transgenic mice expressing Id-1 in mammary epithelial cells, but have not detected any tumor formation. On the other hand, we have found Id-I overexpression in a large fraction of archived human breast cancer samples. The significance of Id-I overexpression in human breast cancer remains to be understood. Additionally, we have shown that E2A proteins in primary mammary epithelial cells and in the MDA-MB-231 breast cancer cell line are degraded through a proteasome mediated pathway. Furthermore, activation of the Notch signaling pathway has been found to accelerate the degradation of E2A proteins. The molecular mechanism underlying Notch-mediated degradation has been investigated. It is therefore possible that activation of Notch signaling pathway associated with mammary tumor formation may involve the elimination of E2A proteins, the putative tumor suppressors.
DTIC
Proteins; Cancer; Mammary Glands; Degradation; Cell Division

20020075723 North Carolina Univ., Chapel Hill, NC USA
Correlative Study of Tumor Hypoxia and Metastatic Potential in Breast Cancer ***Final Report, 1 Sep. 1997-31 Aug. 2001***
Sep. 2001; 21p; In English
Contract(s)/Grant(s): DAMD17-97-1-7279
Report No.(s): AD-A405182; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To study if tumor hypoxia is associated with metastatic potential in breast carcinoma. Breast cancer patients enrolled in an IRB approved study receive hypoxia marker pimonidazole intravenously. Tumor biopsy specimens are examined for pimonidazole binding (hypoxia) and for the bimolecular markers. Regional node metastases data are recorded. Presence of tumor hypoxia has been demonstrated in 8 of 27 patients studied. Tumor hypoxia ranges from 0-33% by an image analysis system. A semiquantitative grading scale of 0-4 (0 = no hypoxia, 4 = highest amount of hypoxia) is useful in breast cancer hypoxia assessments. It is less expensive, can be easily learnt, and can be readily adopted by any clinical immunohistochemistry laboratory. Tumor hypoxia as detected by pimonidazole hypoxia marker ranges from 0-4 on this scale. No toxicities related to pimonidazole administration or the hypoxia marker procedures have been observed. Preliminary data of tumor hypoxia and microvessel density have been presented. The preliminary data show the presence of tumor hypoxia in 30% of the patients studied. Tumor hypoxia in several other cancers is associated with adverse prognosis and tumor aggressiveness. Pimonidazole hypoxia method can be a useful tool to study the significance of tumor hypoxia in breast cancer prognosis and tumor aggressiveness.
DTIC
Neoplasms; Hypoxia; Metastasis; Mammary Glands; Cancer

20020076121 Dukane Corp., Seacom Div., Saint Charles, IL USA
Safeguarding Porpoises
Spinoff 1997; 1997, pp. 86-87; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

The NetMark 1000 by the Dukane Corporation, used to safeguard porpoises from net entanglement, employs technology developed in the late 1960s by NASA engineers at the Langley Research Center. It is based on an underwater location aid, able to withstand high impact, then emit multidirectional signals for hours on end, originally used in the retrieval of NASA payloads following watery touch-downs on Earth. Dukane and Burnett Electronics later obtained a license from NASA, further improving on the beacon design. In a large scale experiment off the coast of New Hampshire in autumn of 1994, it was found that the use of acoustic alarms appears to hold considerable promise in reducing the number of harbor porpoises killed in the sink gill nets

in the Gulf of Maine. Dukane has sold well over 100,000 units. Applications of the pinger are also expanding to other animal species.
Author
Payloads; Porpoises; Safeguard System; Warning Systems; Underwater Explosions; Impact

20020076178 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Study of fischer 344 rats exposed to silica dust for six months at concentrations of 0, 2, 10 or 20 mg / m3
Kutzman, S.; Feb. 01, 1984; 188p; In English
Report No.(s): DE2001-794085; BNL--34617; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The major objective of this study was to relate the results of a series of functional tests to the compositional and structural alterations in the rat lung induced by subchronic exposure to silica dust. Fischer-344 rats were exposed for 6 hours/day, 5 days/week for 6 months to either 0, 2, 10, or 20 mg SiO(sub 2)/m(sup 3). The general appearance of the exposed rats was not different from that of the controls. Interestingly, female rats exposed to silica dust, at all tested concentrations, gained more weight than the controls. The lung weight and the lung-to-body weight ratio was greater in the male rats exposed to the highest concentration of silica dust.
NTIS
Dust; Silicon Dioxide; Lungs; Mammals

20020076289 Institute for Forestry and Nature Research, Texel, Netherlands
Potential of Estimating Plant Photosynthetic Status from High Resolution Spectral Data
Rosema, A.; Havinga, H. N. J.; Jans, W. W. P.; Aug. 2000; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-105855; No Copyright; Avail: National Technical Information Service (NTIS)

In earlier work the relation between (laser induced) chlorophyll fluorescence and photosynthesis has been studied and clarified. Since active laser scanning instruments will not be available in the near future, the present focus is on photosynthesis related changes in the plant spectrum which could be detected by imaging spectrometers. Such changes were anticipated to be the results of changes in the fluorescence evoked by solar radiation (centered at 685 and 730 nm) or in changes of xanthophyll stress pigment content (at 530 nm). Measurements have been made 'in vivo' on a Ficus Robusta leaf and on a Pinus Sylvestris tree (Scots pine) with three instruments: the Laser Environmental Active Fluorosensor (LEAF-NL), the EARS fluorescence Plant Photosynthesis Meter (EARS-PPM), and the GER 2600 field spectrometer. On the tree also sap flow measurements have been done, using the trunk heat balance method. The fluorescence index (FI) and the xanthophylls index (XI), derived from the GER spectral data, show indeed a similar behavior as the emitted chlorophyll fluorescence measured with LEAF-NL or EARS-PPM on the transition from low to high solar radiation.
NTIS
Photosynthesis; Lasers; Trees (Plants); Estimating; Laser Induced Fluorescence; Flow Measurement

20020076292 Colorado Univ., Boulder, CO USA
Microbial Production of Isoprene *Progress Report*
2002; 8p; In English
Report No.(s): DE2002-792551; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We have discovered that microorganisms produce and emit the hydrocarbon isoprene (2-methyl-1,3-butadiene), and have suggested that if isoprene-producing enzymes and their genes can be harnessed, useful hydrocarbon-producing systems might be constructed. The main goal of the proposed work is to establish the biochemical mechanism and regulation of isoprene formation in the bacterial system, Bacillus subtilis. Specific objectives of the proposed work are the following: (A) to characterize the physiological regulation of isoprene formation in B. subtilis; (B) to characterize mutations in B. subtilis 168 that suppress isoprene formation, clone these genes, and determine how isoprene and isoprenoid carbon flow are regulated; and (C) to test ''overflow'' and ''signaling'' models for Bacillus isoprene formation. We are also pursuing the isolation and cloning of B. subtilis isoprene synthase, which we believe may be a regulatory enzyme.
NTIS
Hydrocarbons; Microorganisms; Biochemistry

20020076316 Norwegian Defence Research Establishment, Kjeller Norway
Immuno- and Neurotoxic Effects of Ortho-Substituted Polychlorinated Biphenyls (PCBs)
Voie, A. O.; 2001; 140p; In English
Report No.(s): PB2002-105041; FFI/PUB-99/055502; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
The present study shows that polychlorinated and polybrominated biphenyls elevate intracellular free (CA2+) and activate respiratory burst in human granulocytes.
NTIS
Polychlorinated Biphenyls; Toxicity; Nervous System

20020076348 Executive Office of the President, Washington, DC USA
Interagency Report on the Federal Investment In Microbial Genomics
2002; 44p; In English
Report No.(s): PB2002-108987; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The age of microbial genomics began four years ago with the publication of the complete sequence of Hemophilus influenzae. Since then the number of completed genomes has increased exponentially and, with the growth of high-throughput DNA sequencing facilities, there is no end in sight. The federal investment in microbial genomics has been instrumental in the growth of this field. It has led to the sequencing of model organisms, such as Escherichia coli and Saccharomyces cerevisiae, moving researchers who work on these organisms into the stage of functional genomics, where issues of access to technology, reagents, and computational analyses become significant. Support for sequencing of human pathogens has led to the identification of potentially new strategies that Plasmodium falciparum uses for synthesizing antigenic variants. The investments in sequencing microbes like Thermotoga maritima and Deinococcus radiodurans have led to changes in our understanding of the extent of horizontal gene transfer among prokaryotes and the role of horizontal gene transfer in the evolution of genome structure. This has led to deeper questioning of the nature of bacterial species and has driven fundamental changes in the analysis of prokaryotic evolution.
NTIS
Genes; Genetics; Sequencing

20020076349 National Science and Technology Council, Committee on Science, Washington, DC USA
Microbe Project Report
Jan. 2001; 40p; In English
Report No.(s): PB2002-108985; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Microorganisms have been present for over 3.8 billion years; we have known about their existence for over 300 years. Yet, despite the fact that microbes comprise most of the earths biomass, maintain its environments, and hold the key both to understanding the history and health of life on Earth and to exploiting the full potential of biotechnology for myriad applications, we still know almost nothing about most of them. Now, with the advent of genomics, we are entering a new era of scientific discovery. Recognizing the broad importance of microbial genomics research, in 1999 an interagency task group conducted an informal inventory of Federally-supported research in microbial genomics. While it is clear that genomics offers unprecedented opportunities, this inventory showed that there are major areas of research as yet untouched that would increase our understanding of the broader microbial world, its diversity, and its potential applications. A coordinated interagency (and international) effort is needed to seize the opportunities offered by genome-enabled microbial science. In recognition of this need, the Microbe Project Interagency Working Group was convened in August 2000, and charged with developing a coordinated interagency action plan for microbial genomics activities.
NTIS
Genes; Genetics; Sequencing

20020076379 National Center for Health Statistics, Div. of Health Interview Statistics, Rockville, MD USA
Advance Data from Vital and Health Statistics. Body Weight Status of Adults: USA, 1997-98, No. 330
Schoenborn, C. A.; Adams, P. F.; Barnes, P. M.; Sep. 06, 2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM
Report No.(s): PB2002-109039; No Copyright; Avail: National Technical Information Service (NTIS)

This report presents estimates for underweight, healthy weight, overweight, and obesity for U.S. adults aged 18 years and over. Based on self-reported height and weight, data are shown for selected population subgroups for both sexes and for men and women separately.
NTIS
Body Weight; Public Health

20020077949 California State Univ., Inst. Earth Systems Science and Policy, Seaside, CA USA
Response of Grape Leaf Spectra to Phylloxera Infestation
Johnson, Lee F., California State Univ., USA; March 1999; 18p; In English
Contract(s)/Grant(s): NCC2-975; RTOP 233-01-04-05
Report No.(s): NASA/CR-1999-208765; A-9901226; NAS 1.26:208765; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the 1993 growing season, leaf reflectance and chlorophyll concentrations were monitored with respect to phylloxera (root-louse) infestation in a Napa Valley (California) vineyard. Study plots were established in areas of severely infested, mildly infested, and uninfested sections of the vineyard. A handheld chlorophyll meter, measuring leaf transmittance of near-infrared and red light, confirmed that reduced foliar chlorophyll concentrations were symptomatic of phylloxera stress in the sample vines. Bidirectional reflectance measurements of green and near-infrared light, taken on fresh leaves with a laboratory spectrophotometer, were related to chlorophyll concentration but did not allow discrimination of mildly infested from uninfested vines.
Author
Chlorophylls; Leaves; Spectral Reflectance; Vineyards; Plant Stress

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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.

20020074559 NASA Ames Research Center, Moffett Field, CA USA
Biotelemeters for Space Flights and Fetal Monitoring
Mundt, Carsten W., Sverdrup Technology, Inc., USA; Ricks, Robert D., Sverdrup Technology, Inc., USA; Hines, John W., NASA Ames Research Center, USA; [1999]; 1p; In English; 15th International Symposium on Biotelemetry, 9-14 May 1999, Juneau, AK, USA
Contract(s)/Grant(s): RTOP 131-50-20; ATD-B; No Copyright; Avail: Issuing Activity; Abstract Only

Pill-shaped biotelemeters originally designed for space flight applications will soon be used for monitoring the health of a fetus during and after in-utero fetal surgery. The authors developed a family of biotelemeters that are not only small enough for rodent studies on board the space shuttle or international space station, but also fit through a 10 mm trocar, a plastic tube that is used in endoscopic fetal surgery to obtain minimally invasive access to the fetus. The first 'pill' measures pressure and temperature, and is currently undergoing long-term leakage and biocompatibility tests. A second pill under development measures pH and temperature. A prototype of the 'pH-pill' has been built and successfully tested and is presently being miniaturized into the same dimensions as the 'pressure pill'. Additional pills measuring heart rate, ECG, other ions such as calcium and potassium, and eventually glucose and blood gases, will follow. All pills are designed for ultra-low power consumption yielding lifetimes of up to 10 months in order to meet the requirements of fetal monitoring, but also to provide the capability of long-term space station experiments. Each pill transmits its pulse-interval-modulated signal on a unique carrier frequency in the frequency range of 174-216MHz. A custom-designed multi-channel receiver demodulates and decodes each pill signal and sends the data to a LabVIEW program that performs real-time data analysis and display. A patent for the pill family and its data analysis system is pending.
Author
Fetuses; Health; Bioinstrumentation; Measuring Instruments

20020075037 Naval Medical Research Center, Silver Spring, MD USA
A Pill to Prevent the Bends?
Kayar, Susan R.; Jan. 2001; 3p; In English
Report No.(s): AD-A405025; NMRC 01-094; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The risk of decompression sickness increases sharply if you go deeper, stay longer or surface more rapidly than recommended by accepted dive plan guidelines. and even if you do obey all the rules, the risk of bending is never zero. So, wouldn't it be nice if there were some way to help increase your level of safety?

DTIC
Decompression Sickness; Safety

20020076149 DiaSys Corp., Waterbury, CT USA
Automated Analysis Workstation
Spinoff 1997; 1997, pp. 52-53; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Information from NASA Tech Briefs of work done at Langley Research Center and the Jet Propulsion Laboratory assisted DiaSys Corporation in manufacturing their first product, the R/S 2000. Since then, the R/S 2000 and R/S 2003 have followed. Recently, DiaSys released their fourth workstation, the FE-2, which automates the process of making and manipulating wet-mount preparation of fecal concentrates. The time needed to read the sample is decreased, permitting technologists to rapidly spot parasites, ova and cysts, sometimes carried in the lower intestinal tract of humans and animals. Employing the FE-2 is non-invasive, can be performed on an out-patient basis, and quickly provides confirmatory results.

Author
Manufacturing; Workstations; Intestines; Cysts

20020076150 Epner Technology, Inc., Brooklyn, NY USA
Gold Coating
Spinoff 1997; 1997, pp. 50-51; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Epner Technology Inc. responded to a need from Goddard Space Flight Center for the ultimate in electroplated reflectivity needed for the Mars Global Surveyor Mars Orbiter Laser Altimeter (MOLA). Made of beryllium, the MOLA mirror was coated by Epner Technology Laser Gold process, specially improved for the project. Improved Laser Gold- coated reflectors have found use in an epitaxial reactor built for a large semiconductor manufacturer as well as the waveguide in Braun-Thermoscan tympanic thermometer and lasing cavities in various surgical instruments.

Author
Laser Altimeters; Mirrors; Reflectors; Coatings; Gold

20020076193 Electrologic of America, Inc., Dayton, OH USA
Muscle Stimulation Technology
Spinoff 1997; 1997, pp. 48-49; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under a Goddard Space Flight Center contract, Electrologic of America was able to refine the process of densely packing circuitry on personal computer boards, providing significant contributions to the closed-loop systems for the Remote Manipulator System Simulator. The microcircuitry work was then applied to the StimMaster FES Ergometer, an exercise device used to stimulate muscles suffering from paralysis. The electrical stimulation equipment was developed exclusively for V-Care Health Systems, Inc. Product still commercially available as of March 2002.

Author
Simulators; Remote Manipulator System; Physical Exercise; Personal Computers; Muscles; Ergometers

20020076302 Federal Aviation Administration, Civil Aerospace Medical Inst., Oklahoma City, OK USA
An Accurate Method for the Determination of Carbon Monoxide in Postmortem Blood Using GC/TCD ***Final Report***
Lewis, Russell J., Federal Aviation Administration, USA; Johnson, Robert D., Federal Aviation Administration, USA; Canfield, Dennis V., Federal Aviation Administration, USA; August 2002; 10p; In English
Contract(s)/Grant(s): AM-B-02-TOX-204
Report No.(s): DOT/FAA/AM-02/15; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the investigation of aviation accidents, postmortem samples from accident victims are submitted to the FAA's Civil Aerospace Medical Institute for toxicological analysis. to determine if the accident victim was exposed to an in-flight/post-crash fire or faulty heating/exhaust system, the analysis of carbon monoxide (CO) is conducted. While our laboratory predominantly uses a spectrophotometric method for the determination of carboxyhemoglobin (COHb), we consider it essential to confirm with a second technique based on a different analytical principle. Our laboratory encountered difficulties with many of our postmortem samples while employing a commonly used GC method. We believed these problems were due to elevated methemoglobin (MetHb) concentration in our specimens. MetHb does not bind CO, thus elevated MetHb levels will result in a loss of CO binding capacity. Since most commonly employed GC methods determine %COHb from a ratio of unsaturated blood to CO-saturated blood, a loss of CO binding capacity will result in an erroneously high %COHb value. Our laboratory has developed a new GC method for the determination of %COHb that incorporates sodium dithionite, which will reduce any MetHb present to Hb. Using numerous fresh human blood controls ranging from 1% to 67% COHb, we found no statistically significant differences between %COHb results from our new GC method and our spectrophotometric method. We then applied our new GC method to putrefied and non-putrefied postmortem samples. to validate the new GC method, postmortem samples were analyzed with our existing spectrophotometric method, a GC method commonly used without reducing agent, and our new GC method with the addition of sodium dithionite. As expected, we saw errors up to and exceeding 50% when comparing the unreduced GC results with our spectraphotometric method. With our new GC procedure, which incorporates a reducing agent, the error was virtually eliminated. Author

Aircraft Accident Investigation; Toxicology; Carbon Monoxide Poisoning; Carboxyhemoglobin

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BEHAVIORAL SCIENCES

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

20020074820 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Mood and Vigilance Following Quercetin Supplementation

Olson, Craig A.; Jul. 22, 2002; 90p; In English

Report No.(s): AD-A405046; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

There is a high degree of military interest in the effects of specific nutritional constituents on cognitive function. This double-blind, placebo-controlled study was undertaken to test whether quercetin aglycone affects mood and vigilance in humans. Block randomization was used to assign 57 Department of Defense personnel into three groups. Based on group assignment, each subject received a one-time dose of 200 mg caffeine plus 1,800 mg placebo, 2,000 mg quercetin or 2,000 mg placebo 1 hour prior to completing a 45-minute scanning visual vigilance task. Profile of Mood States (POMS) questionnaires were completed prior to treatment and immediately following the vigilance test to measure change in subjective mood ratings. Caffeine and quercetin concentrations were measured in plasma samples collected 2-hours after treatment. The caffeine group significantly outperformed the placebo group with regard to correct detection of stimuli as well as reaction time during the vigilance task; no other groups were significantly different from one another.

DTIC

Cognition; Nutrition; Caffeine; Human Performance

20020074896 Army Aeromedical Research Lab., Fort Rucker, AL USA

A Comparison Between the Countermeasures Modafinil and Napping for Maintaining Performance and Alertness Using a Quasi-Experimental Analysis ***Final Report***

Caldwell, J. L.; Caldwell, John A., Jr.; Roberts, Krisit A.; Jul. 2002; 39p; In English

Report No.(s): AD-A405112; USAARL-2002-14; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The data from two separate studies were combined in order to statistically compare the efficacy of the wakefulness-promoting substance modafinil to a 2 hours nap for sustaining cognitive skill and psychological mood in helicopter pilots who have been deprived of sleep (other than the nap). Performance data from the Multiattribute Task Battery (MATB) and mood data from the Profile of Mood States (POMS) were analyzed for this comparison. Eighteen subjects' data from the Napping study were merged with six subjects' data from the Modafinil study (the data were collected at similar testing times). Baseline-adjusted difference scores were analyzed. A three-way mixed factorial analysis of variance (ANOVA) was used with one grouping factor (Modafinil study versus Napping study) and two repeated-measures factors. Condition (Treatment or No Treatment) and Time (specific to each test). The two countermeasures were effective in combating the usual decline in cognitive performance and mood during sleep deprivation, but they were not comparable. It appears that modafinil was superior to naps in maintaining alertness. The

subjective mood data indicated that both countermeasures were successful at decreasing fatigue and confusion, and increasing vigor when compared to no intervention at all. However, when comparing modafinil and a nap, modafinil maintained a higher level of vigor and a lower level of fatigue than the nap, particularly in the early morning hours when the circadian dip in alertness is most problematic. The performance data supported the subjective mood findings by showing that, while both strategies attenuated performance losses during sustained wakefulness, modafinil was more efficacious than a nap. This was especially true of reaction time and errors of omission. As with subjective mood, modafinil's superiority was particularly evident in the early morning hours.
DTIC
Sleep Deprivation; Mental Performance

20020075729 Technische Univ., Delft, Netherlands
Neurochemical Networks, Nonlinear Systems and Functional Neuroimaging
Dekker, A. J.; 1998; 76p; In English
Report No.(s): PB2002-105047; REPT-98-44; Copyright; Avail: National Technical Information Service (NTIS), Microfiche
This report introduces a neurochemical network model for brain processes: the configuration parameters of the network are the concentrations of M compounds at N locations and these concentrations are connected both spatially and biochemically. A phase space can be constructed to plot the behavior of the network. A brief overview is given of Hamiltonian and dissipative systems, to provide the background for a description of neurochemical networks as nonlinear systems. A set of updating rules defines the changes in the neurochemical network. Updating can result in qualitative changes (both continuous and discontinuous) in the behavior of the network. Hamiltonian and gradient behavior for updating and limits to updating are discussed.
NTIS
Nonlinear Systems; Brain; Neurology; Image Processing

20020076152 Creative MultiMedia, Inc., Houston, TX USA
Stress Management by Biofeedback
Spinoff 1997; 1997, pp. 72-73; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.
In the 1980's, Dr. Patrick Doyle served on a project to train U.S. astronauts at Johnson Space Center in biofeedback techniques to control anxiety and hypertension. Traditional biofeedback concepts were found to be too mundane, repetitive and boring, so Doyle developed Bio-Games with more interesting and involved formats. The first product, Bio-Ball, is an interactive, multimedia baseball video game that is played by relaxing in order to hit the ball. Gradually the player is able to relax at will, and with practice is able to apply the skills to real-life situations. Doyle has since gone on to create a number of biofeedback games marketed by Creative MultiMedia Inc. including Bio-Golf, Clutch City, and Pachyderm. Stress-busting screen savers are also being marketed under the Buddies series. In addition to being used in the corporate world, Bio-Games have been recognized by the Starbright Foundation which focuses on improving the total hospital environments of critically injured and chronically-ill children.
Author
Astronauts; Biofeedback; Games; Hypertension

20020076202 Old Dominion Univ., Norfolk, VA USA
Evaluating the Ability of Heart Rate and EEG to Control Alertness during Performance ***Final Report***
Freeman, Fred, Old Dominion Univ., USA; [2002]; 18p; In English
Contract(s)/Grant(s): NCC1-01012
Report No.(s): ODURF-111191; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The major focus of the present proposal was to examine psychophysiological indices that show promise for invoking different modes of automation in an adaptive automation system. With the increased use of automation in today's work environment, people's roles in the work place are being redefined from that of active participant to one of passive monitor. Although the introduction of automated systems has a number of benefits, there are also a number of disadvantages regarding worker performance. Byrne and Parasuraman have argued for the use of psychophysiological measures in the development and the implementation of adaptive automation. While performance based, model based, and psychophysiologically based adaptive automation systems have been studied, the combined use of several psychophysiological measures has never been investigated. Such a combination provides the advantage of real time evaluation of the state of the subject in two relevant dimensions and offers a more realistic approach to the implementation of adaptive automation compared to the use of either dimension by itself.
Author
Heart Rate; Electroencephalography; Adaptive Control; Performance Prediction; Alertness

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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..

20020074902 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Ergonomic Impact of Glove Use in a Coating Removal Task
Rybczynski, Ian C.; Jan. 2002; 116p; In English
Report No.(s): AD-A405064; AFIT-CI02-172; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Workers who are in maintenance and repair occupations are routinely exposed to several musculoskeletal disorder risk factors. The purpose of this study was to investigate the effects of glove use during a coating removal task, which is a common maintenance and repair task. Nine healthy subjects (5 male and 4 female) participated in this study. The subjects removed identical painted sections using either a metal finishing (nylon) pad or a plastic scraper, while wearing one of thirteen glove conditions. The order of the glove conditions was randomized for each subject. Force exertions were monitored along with EMO readings from the finger flexors, finger extensors, biceps, and triceps. The results showed that there were significant increases in force outputs and muscle activities when using gloves as compared to a barehanded condition. There was some evidence that indicated glove material and glove thickness are important characteristics in these observations. These findings may have implications for a worker's musculoskeletal disorders risk and for glove selection guidelines in industry.
DTIC
Gloves; Musculoskeletal System; Human Factors Engineering; Coating; Occupation

20020074906 Army Research Inst. for the Behavioral and Social Sciences, Alexandria, VA USA
Human-System Integration for Future Command and Control: Identifying Research Issues and Approaches ***Final Report, Oct. 2001-May 2002***
Lickteig, Carl W.; Sanders, William R.; Shadrick, Scott B.; Lussier, James W.; Holt, Brian J.; Jul. 2002; 47p; In English
Report No.(s): AD-A405044; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Army's transformation to Future Combat Systems (FCS) poses an unprecedented alliance of humans and machines, particularly for Command and Control (C). Creating a human-machine alliance that actually improves command and control is a severe challenge in human-system integration for FCS. First, this report selectively identifies four overarching research issues for command and control: Allocation, Autonomy, Authority, and Awareness. Second, two complementary research approaches, mid-scale and small-scale transformation environments, for investigating human-system integration issues are described. An example of a mid-scale transformation environment from the FCS C2 program is provided with selected results on human-system integration. The value added by small-scale transformation environments, however, is needed to maintain a human-centric focus and provide two unique roles: a breeding ground for innovation to larger environments, and proving ground for issues from larger environments. An example of an emerging small-scale transformation environment directed at FCS concept exploration and training is provided. The core technical, operational and human performance assets currently available for this small-scale transformation environment are described. The report's intended audience includes any members of the user, researcher, and developer community who might benefit from, or provide benefit to, the Army's ongoing FCS research program.
DTIC
Human Factors Engineering; Command and Control; Man Machine Systems; Weapon System Management

20020075030 Air Force Research Lab., Directed Energy Bioeffects Div., Brooks AFB, TX USA
Adaptation to Visual Tracking With a Central Simulated Scotoma ***Final Report, 198902992***
McLin, Leon N., Jr; Jul. 2002; 40p; In English
Contract(s)/Grant(s): Proj. 7757
Report No.(s): AD-A405068; AFRL-HE-BR-TR-2002-0134; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Lasers on the battlefield could produce retinal injury that results in a blind spot (scotoma) in a person's central vision. The effect of a central 3 degree artificial scotoma on tracking and shooting with 3 different levels of target path difficulty and the effect of practice on the ability to track with a scotoma are reported. A three-degree artificial scotoma was produced using an SRI dual-Purkinje-image eyetracker. Subjects monocularly tracked a 6 minute of arc target with a joystick controlled cross hair. Eighteen subjects, 6 for each target path difficulty level, made 20, 1 minute tracking runs per day for 7 days. RMS error for the eye to target distance, cross hair to target distance, and the cross hair to target distance when shooting were determined. Eye position was monitored throughout the trial to determine tracking strategy. Three-degree scotomas decreased tracking and aiming performance dramatically for all three target path difficulty levels. The effect of a scotoma was greatest on the first trials when

they were introduced and there was improvement with practice. All subjects learned to keep the scotoma away from the target and cross hair so that they would not be hidden by the scotoma. This strategy improved their performance. However, no subjects improved to their level of performance without a scotoma. These results further substantiate previous results indicating that scotomas may have significant impact on the completion of operational missions. Practice and exposure to a simulated scotoma may lessen but not eliminate the decrease in performance resulting from a central scotoma.
DTIC
Eye (Anatomy); Optical Tracking; Vision; Eye Movements; Computerized Simulation

20020075040 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Coupling Retinal Scanning Displays to the Human Visual System: Visual System Response and Engineering Considerations
Turner, Stuart L.; Aug. 14, 2002; 290p; In English
Report No.(s): AD-A405084; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

A retinal scanning display (RSD) is a visual display that presents an image to an observer via a modulated beam of light that is directed through the eye's pupil and rapidly scanned in a raster-like pattern across the retina. As compared to conventional displays that create a real image for viewing, the RSD induces a virtual image only in the mind of the observer. The spatio-temporal characteristics of the RSD retinal stimulation are unique, as are the optical geometries of the small Maxwell ian view exit pupil and the entry of image forming rays into the eye. This body of research examined the retinal and opto-physiological responses of the human visual system to RSD stimuli and derived human interface and engineering concepts founded upon unique visual system responses. The retinal response to RSD stimuli was found to be consistent with accepted theories of human visual response. The physiological response of the eye pupil to the Maxwellian view RSD was found to be different from natural view pupillary response models in literature. A broad set of RSD pupillary response models was empirically derived from experimental data. An examination of the RSD interface concept of arrayed small Maxwellian view exit pupils was conducted. The arrayed exit pupil concept was found to be a viable solution to some RSD interfacing challenges. Fundamental perceptual characteristics of arrayed exit pupil RSD's were qualified and basic human observer preferences for arrayed pupil parameters was modeled. Human factors engineering guidelines for implementation of arrayed exit pupil displays were derived.
DTIC
Eye (Anatomy); Retina; Scanning; Human Factors Engineering; Display Devices; Visual Stimuli

20020075731 Swedish Transport and Communications Research Board, Stockholm, Sweden
Detection and Identification of Information Presented Peripherally inside the Car: Effects of Driving Task Demands, Stimulus Position and Direction of Motion of the Stimulus
Falkmer, T.; Nilsson, L.; Toernros, J.; 2000; 42p; In English
Report No.(s): PB2002-106253; VTI-RAPP-461A; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim was to study the performance of an in-car information system relying exclusively on information presented peripherally by 'running light' stimuli. The information was presented on displays placed in four different positions; upper, lower, to the right, and to the left. Four different directions of the 'Running light' were used; upwards, downwards, to the right and to the left. Two levels regarding driving task demands were used. Thirty-two subjects participated in the study. A repeated-measures design was used. The study was performed in an advanced driving simulator. The subjects' task was to report the direction of motion of the peripheral stimuli as quickly as possible.
NTIS
Display Devices; Peripheral Vision; Motor Vehicles; Simulators

20020076122 Gateway Technologies, Inc., Boulder, CO USA
Thermal Clothing
Spinoff 1997; 1997, pp. 78; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Gateway Technologies, Inc. is marketing and developing textile insulation technology originally developed by Triangle Research and Development Corporation. The enhanced thermal insulation stems from Small Business Innovation Research contracts from NASA's Johnson Space Center and the U.S. Air Force. The effectiveness of the insulation comes from the microencapsulated phase-change materials originally made to keep astronauts gloved hands warm. The applications for the product range from outer wear, housing insulation, and blankets to protective firefighting gear and scuba diving suits. Gateway has developed and begun marketing thermal regulating products under the trademark, OUTLAST. Products made from

OUTLAST are already on the market, including boot and shoe liners, winter headgear, hats and caps for hunting and other outdoor sports, and a variety of men's and women's ski gloves.
Author
Gloves; Insulation; Linings; Protective Clothing; Thermal Insulation; Wear

20020076151 BodyBilt, Inc., Navasota, TX USA
Ergonomic Chairs
Spinoff 1997; 1997, pp. 74; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Findings published in the NASA Anthropometric Source Book by Johnson Space Center helped BodyBilt, Inc. to fashion controlled comfort chairs that lessen the harmful effects of gravity on seated workers. Crew members living aboard NASA's Skylab noted that in space the human posture differs from the normal posture caused by the tug of one gravity. There has been an alarming increase in back pain and muscle fatigue in workers, along with a dramatic escalation in repetitive stress injuries. BodyBilt's ergonomically-correct line of office chairs are targeted for the average worker that sits for prolonged periods, be it in the classroom or boardroom. Their roster of national clients lists such organizations as IBM, Microsoft, Texas Instruments, Hewlett-Packard, Eastman-Kodak, Boeing, Motorola, and Walt Disney Studios.
Author
Seats; Pain; Muscles; Human Factors Engineering; Gravitational Effects; Anthropometry

20020076341 Swedish Defence Research Establishment, Man-System-Interaction, Linkoeping, Sweden
Effect of Muscular Straining on G-Protection during Assisted Pressure Breathing
Eiken, O.; Koelegard, R.; Lindborg, B.; Mekjavic, I.; Linder, J.; Oct. 2001; 18p; In English
Report No.(s): PB2002-107193; FOI-R-0230-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose was to study the effect of anti-G straining maneuvers on the less than protective properties afforded by the anti-G ensemble used in the FAS 39 Gripen aircraft (AGE-39). Ten subjects were studied in a centrifuge using: (1) the AGE-39 in combination with full anti-G straining maneuvers (AGSM) throughout each high-G exposure (Full Maneuver; FM) and (2) the AGE-39 in combination with AGSM during the initial part of each high-G exposure (Reduced Maneuver; RM). G-intensity tolerance was established during exposures to Rapid Onset Rate (ROR) profiles with G-plateau levels ranging from 6.5 to 9.0 G. G-endurance was studied during Simulated Aerial Combat Maneuvers (SACM) consisting of ten cycles of 5.5 to 7.5 G.
NTIS
High Gravity Environments; Pressure Breathing; Centrifuging Stress; Tolerances (Physiology)

20020076395 NASA Langley Research Center, Hampton, VA USA
The Relationship of Self-Efficacy and Complacency in Pilot-Automation Interaction
Prinzel, Lawrence J., III, NASA Langley Research Center, USA; September 2002; 26p; In English
Contract(s)/Grant(s): RTOP 711-50-21-01
Report No.(s): NASA/TM-2002-211925; NAS 1.15:211925; L-18231; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Pilot 'complacency' has been implicated as a contributing factor in numerous aviation accidents and incidents. The term has become more prominent with the increase in automation technology in modern cockpits and, therefore, research has been focused on understanding the factors that may mitigate its effect on pilot-automation interaction. The study examined self-efficacy of supervisory monitoring and the relationship between complacency on strategy of pilot use of automation for workload management under automation schedules that produce the potential for complacency. The results showed that self-efficacy can be a 'double-edged' sword in reducing potential for automation-induced complacency but limiting workload management strategies and increasing other hazardous states of awareness.
Author
Pilot Performance; Man Machine Systems; Pilot Error; Pilot Support Systems

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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.

20020075727 Technische Univ., Delft, Netherlands
Existence of a Short Admissible Pivot Sequences for Feasibility and Linear Optimization Problems
Fukuda, K.; Terlaky, T.; 1998; 30p; In English
Report No.(s): PB2002-105059; REPT-98-48; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The authors have shown that with no degeneracy assumption a short sequence of admissible pivots from any basis to an optimal basis exists. The length of this admissible pivot path is bounded by m + n. This result is in contrast with the result provided by Fukuda, Luthi and Kamiki. They proved that in the fully nondegenerate case the length of such a path can be bounded by m. As an introduction to the general LP case and explore some of the authors' techniques in degenerate situations, they have proved that from any basis a short admissible pivot path exists which leads to a feasible basis both for the primal and dual feasibility problems. The length of the respective paths are bounded by n and m, the size of the dual and primal bases, respectively.
NTIS
Optimization; Linear Programming; Feasibility Analysis; Sequencing

20020076312 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Foliated Manifolds and Conformal Heat Morphisms
Loubeau, E.; Kolsrud, T.; 2001; 30p; In English
Report No.(s): PB2002-106268; TRITA-MAT-00-MA-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The objects under study, in this article, are Riemannian manifolds foliated by hypersurfaces. Looking at the transverse direction as time, the authors construct the generalized heat operator and, in the spirit of a time-space extension of harmonic morphisms, the authors introduce the conformal heat morphisms. Concrete examples of these concepts are presented, as well as, a characterization of conformal heat morphisms. Lastly, the authors calculate the heat Lie algebra of the generalized heat operator.
NTIS
Riemann Manifold; Stochastic Processes; Algebra; Lie Groups

20020076313 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Lower Bounds for the Number of Periodic Billiard Trajectories in Manifolds Embedded in Euclidean Space
Duzhin, F.; Jan. 2001; 22p; In English
Report No.(s): PB2002-106267; TRITA-MAT-01-MA-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors shall study the lower bounds for the number of the periodic billiard trajectories in manifolds embedded in Euclidean space. A p-periodic billiard trajectory is a closed polygon consisting of p segments, all of whose vertices belong to the given manifold and, at every vertex, the two angles formed by the line and the manifold are equal (the exact definition will be given later). The first who considered this problem was George Birkhoff. He proved the following fact. Suppose p grater than 2 is an odd prime; M is a strictly convex smooth closed curve then there exist in M at least two periodic billiard trajectories for each rotation number from 1 to (p-1)/2. In Section 2 the authors show how one can apply Morse theory to study periodic billiard trajectories. Section 3 contains the generalized Birkhoff theorem. In Section 4 the authors prove the Farber-Tabachnikov estimate for generic small perturbations of the standard round n-sphere for any n. In Section 5 the authors study 3-periodic billiard trajectories of the standard round n-sphere for any n. In Section 5 the authors study 3-periodic billiard trajectories in a two-dimensional sphere. At last in Section 6 the authors find an estimate for the number of 3-periodic billiard trajectories in any two-dimensional manifold.
NTIS
Manifolds (Mathematics); Polygons; Two Dimensional Models; Trajectories

20020076360 Saint Petersburg State Univ., Dept. of Mathematics and Mechanics, Saint Petersburg, Russia
Linear Operators with p-Nuclear Adjoints
Reinov, O. I.; 2000; 10p; In English
Report No.(s): PB2002-106089; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

If p epsilon (1,+ infinity) and T is a linear operator with p-nuclear adjoint from a Banach space X to a Banach space Y then if one of the spaces X asterisk or Y 3 asterisks has the approximation property, then T belongs to the ideal N (supp) of operators which can be factored through diagonal operators l (sub p) yields l (sub 1). On the other hand, there is a Banach space W such

that W 2 asterisks has a basis and such that for each p epsilon (1;+ infinity), p equals 2; there exists an operator T : W 2 asterisks yields W with p-nuclear adjoint that is not in the ideal N (supp), as an operator from W 2 asterisks to W.
NTIS
Adjoints; Banach Space; Linear Operators; Approximation

20020076361 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Absolute Continuity of Spectra of Two-Dimensional Magnetic Periodic Schroedinger Operators with Density Like Electric Potentials
Shterenberg, R. G.; Jan. 2001; 30p; In English
Report No.(s): PB2002-106266; TRI-TA-MAT-01-02; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A two-dimensional magnetic periodic Schrodinger operator with variable metric is considered. Electric potential is suggested to be a distribution formally given by the expression dv/dx, where dv is a period signed measure with a locally finite variation. The authors assume that the perturbation generated by the electric potential is strongly subordinate (in the sense of forms) to the free operator. Under this natural assumption, the authors prove that the spectrum of the Shrodinger operator is absolutely continuous.
NTIS
Schroedinger Equation; Electric Potential; Operators (Mathematics); Continuity (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.

20020075028 TRW, Inc., Fairfax, VA USA
Measuring Digital Proficiency: Assessment Approaches and Echelon Considerations ***Final Report, Jan. 2001-Jan 2002***
Dudley, Marcus G.; Hill, Randall; Johnston, John C.; Jones, William S.; LeGare, Marc; Jun. 2002; 81p; In English
Contract(s)/Grant(s): DASW01-99-D-0013; Proj. A790
Report No.(s): AD-A405055; RR-1791; ARI-RR-1791; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Digitization threatens to overwhelm trainers with observation requirements, making it crucial to identify aspects of unit performance likely to warrant the attention of trainers and others with a need to measure unit digital proficiency. This report encompasses two approaches used to target high-payoff measurement objectives. First, the research team described differences between brigade and battalion echelons in terms of how digital systems are employed. This approach assumed that a high priority for brigade exercises is to address brigade-unique aspects of digital proficiency. Second, the team described how units can use digital systems to gain two of the major advertized benefits of digitization, reducing fratricides and gaining greater control over how and when contact is made with the enemy. In addition to describing unit actions that can be supported by effectives use of digital systems (e.g., supporting unit transition from movement to maneuver), the team considered whether it is better to measure digital support of each action using an all-or-none approach or a graded approach. This latter consideration provides input for efforts to define digital proficiency levels.
DTIC
Digital Systems; Digital Techniques; Combat; Training Devices

20020076158 Immersion Corp., San Jose, CA USA
Force Feedback Joystick
Spinoff 1997; 1997, pp. 77; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

I-FORCE, a computer peripheral from Immersion Corporation, was derived from virtual environment and human factors research at the Advanced Displays and Spatial Perception Laboratory at Ames Research Center in collaboration with Stanford University Center for Design Research. Entrepreneur Louis Rosenberg, a former Stanford researcher, now president of Immersion, collaborated with Dr. Bernard Adelstein at Ames on studies of perception in virtual reality. The result was an inexpensive way to incorporate motors and a sophisticated microprocessor into joysticks and other game controllers. These devices can emulate the feel of a car on the skid, a crashing plane, the bounce of a ball, compressed springs, or other physical

phenomenon. The first products incorporating I-FORCE technology include CH- Products' line of FlightStick and CombatStick controllers.
Author
Virtual Reality; Microprocessors; Human Factors Engineering; Feedback; Controllers

20020076189 Fermi National Accelerator Lab., Batavia, IL USA
SAM managed cache and processing for clusters in a worldwide grid-enabled system
Baranovski, A.; Jul. 17, 2002; 9p; In English
Report No.(s): DE2001-797094; FERMILAB-TM-2175; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

SAM has been developed within the Computing Division at Fermilab as a versatile, distributed, data management system. One of its many features is its ability to control processing and manage a distributed cache within a cluster of compute servers. Requirements, concepts, and features of this system are described and issues involved in interfacing it to several batch systems are discussed. The system is used within the Dzero experimental collaboration to distribute hundreds of Terabytes of data for processing and analysis around the world. Several hardware configurations deployed at Fermilab are described. Data is currently disseminated using this system to over two dozen sites worldwide, and this number will grow to nearly one hundred in the coming years. The planned design evolution to accommodate this growth is discussed, and the transition of the system to grid standard middleware is described.
NTIS
Data Management; Deployment

61
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.

20020074371 Naval Postgraduate School, Monterey, CA USA
Developing a Conceptual Unmanned Aerial Vehicle Communications Mobile Ad Hoc Network Simulation Model
Blackshear, Henry L., Jr; Jun. 2002; 61p; In English; Original contains color images
Report No.(s): AD-A404703; No Copyright; Avail: CASI; A04, Hardcopy

A growing demand for increased networking interoperability has spawned a requirement for ad hoc networking. One proposal to satisfy the need is development of Unmanned Aerial Vehicle (UAV) communications Mobile Ad Hoc Networks (MANET). In order to establish these UAV MANETs, a large set of Internet Protocol (IP) based routing protocols must be analyzed to determine suitability for incorporation into the UAV MANET. This thesis represents the initial phase in developing a simulation model to look at routing performance parameters for the conceptual UAV MANET. The Optimum Network Performance (OPNET) simulation software tool was used for this analysis. Analysis and simulations of the Ad Hoc On-Demand Vector Protocol (AODV), Dynamic Source Routing protocol (DSR), and Zone Routing Protocol (ZRP) were conducted to determine their suitability for the UAV MANET model. Results conclude that some routing protocols are more suitable for military operations than others and that development of MANET gateway models are required. Additionally, network management and security issues for this conceptual network are addressed.
DTIC
Performance Prediction; Protocol (Computers); Communication Networks

20020074380 SRI International Corp., Menlo Park, CA USA
Improved Barriers to Turbine Engine Fragments: Final Annual Report ***Final Report***
Shockey, Donald A.; Erlich, David C.; Simons, Jeffrey W.; Jun. 2002; 50p; In English; Original contains color images
Report No.(s): AD-A404817; SRI-95-G-010; DOT/FAA/AR-99/8-V; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This final annual technical report describes the progress made during year 4 of the SPI International Phase II effort to develop a computational capability for designing lightweight fragment barriers for commercial aircraft. Fabrics of high-strength polymers have proven to be excellent candidates for these barriers. Previous large-scale fragment impact testing of comer peg-mounted fabric barriers indicated that the failure of the fabric around the pegged hole was a significant factor in the barrier's effectiveness. Thus, SRI designed and implemented a laboratory test to characterize fabric failure behavior in the vicinity of a pegged hole. A

series of these fabric corner failure tests in both Zylon and Kevlar fabrics determined that significant energy can be absorbed in corner tearing. These tests also showed the effects of various parameters on this energy. SRI then performed a second series of large-scale fragment impact tests at its remote test site, using stand-alone fabric barriers attached to a rigid frame through pegs near the four comers. The pegged comer holes were positioned far enough from the fabric edges to allow significant comer tearing without complete comer detachment. Tests revealed a relatively small effect of fragment roll angle and a large effect of impact location (with respect to the center of the barrier) upon the ballistic efficiency of the barrier. In some cases, Keviar could be as effective as (or more effective than) Zylon, due to the larger fraction of impact energy consumed in producing comer tearing. A considerable database of large-scale fragment impact tests into Zylon and Kevlar fabric ballistic barriers is now available for fabric computational model refinement and verification. A simplified finite element fabric model has been developed for use as a design tool for choosing or evaluating parameters for fragment barriers.
DTIC
Aircraft Engines; Textiles; Fragments

20020074578 Naval Postgraduate School, Monterey, CA USA
A Simulation to Determine the Effect that the Army Basic Officer Leadership Course Will Have on Accession Training
Hovda, Erik K.; Jun. 2002; 135p; In English; Original contains color images
Report No.(s): AD-A404881; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The USA Army is currently considering a significant change in the way they train newly commissioned officers. The Army's Training and Doctrine Command (TRADOC) plans to add a course to accession training called the Basic Officer Leadership Course (BOLC), which would teach officers of all Army Competitive Category (ACC) branches core leadership and common skills requirements at three Army installations in the USA. This thesis develops a simulation that explores the length of time newly commissioned officers spend training once TRADOC implements BOLC and establishes training policies for the new course. The model is implemented in the Java programming language, with Simkit as the simulation package. The simulation output is a list of 225,000 simulated officers with their training time recorded, which I aggregate into mean and variance measurements for each design point. Upon this aggregated data I execute a regression analysis, which feeds into a loss function that penalizes excess time spent in accession training. Minimizing the loss function returns optimal policy settings for BOLC's implementation. This analysis shows that the most significant policies in the accession training system are the maximum and minimum class size for a BOLC class and the ratio of ROTC officers who receive immediate active duty status upon commissioning. My analysis also shows that placing BOLC into the simulated accession training system caused an increase of approximately 23 days in training time.
DTIC
Education; Leadership; Armed Forces (USA); Computerized Simulation; Computer Programming

20020074584 Secretary of the Air Force, Washington, DC USA
Managing Messaging and Data Processing Centers
Coari,; Webb,; Mar. 01, 1998; 48p; In English
Report No.(s): AD-A404850; AFI33-113; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document was substantially revised and must be completely reviewed. It eliminates operational requirements for the retired automated message processing exchange (AMPE) system; eliminates the limited distribution (LIMDIS) special handling designator; establishes DMS operational policies and procedures, including security requirements and mail list management; defines new DMS terms, abbreviations, and acronyms; and identifies DMS hierarchy organizational roles and responsibilities. It adds Attachment 5 to help users develop a checklist that manages taskings imposed by this publication.
DTIC
Information Systems; Telecommunication; Message Processing

20020074591 New South Wales Univ., School of Computer Science and Engineering, Australia
Forced Simulation: A Formal Approach to Component Based Development of Embedded Systems
Roop, Parthasarathi, New South Wales Univ., Australia; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Application specific digital systems, called embedded systems touch almost every aspect of modem human life. As a result, there is considerable interest in automating the design (called synthesis) of these systems. Further, given the time-to-market pressures and increasing system complexities, component reuse during synthesis is being touted as a key to success. This thesis proposes a formal framework for reusing system-level components during synthesis. Within the framework for component reuse, component matching is a key problem that must be addressed. Given the specification of a design function, and a device stored

as a component in a library, component matching addresses the question of whether the device can implement the function. Often system-level components arc multi-functional and generic, and it is rarely the case that the function is directly realizable by a device. Hence, an important aspect of matching is to decide whether the device can be dynamically adopted to match the function, This thesis proposes a formalization of the matching problem using formal models of the function and device, denoted by F and D respectively. D matches F provided there exists an interface I that adapts D dynamically to produce the same behaviour as F. None of the existing implementation verification techniques within formal methods can be used to test for the existence of an I between arbitrary pairs of F and D. In this thesis, a new simulation relation called forced simulation is proposed between the states of F and D. It is then formally established that the existence of a forced simulation relation is a necessary and sufficient condition for te existence of I for a pair of F and D. Two kinds of forced simulation are proposed, one each for synchronous and asynchronous interactions with the environment. Based on forced simulation, a polynomial time algorithm for automatic matching of F and D is also developed. The distinguishing feature of the algorithm is that when successful, it generates an interface that automatically adapts the device to behave like the function. The algorithm is illustrated by reusing two programmable components from Intel mid some typical embedded controllers.
Author
Digital Systems; Algorithms; Polynomials; Simulation; Synchronism

20020074650 New South Wales Univ., School of Computer Science and Engineering, Australia
Programming with Pictures and Homomorphic Planning
Thurbon, Joseph Anthony, New South Wales Univ., Australia; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

While single diagrams can convey large amounts of information compactly, there are many interesting domains where sequences of diagrams are used in every day life. For example, each Lego(TM) kit is accompanied by instructions that are almost free from text, yet are easily comprehensible to the youngest of children. Programmers routinely appeal to diagrams not only to express the static elements of software systems (eg. class diagrams in UML), but also the dynamics of the topological structure of programs as they execute. In these and other situations, sequences of diagrams are used to succinctly and exactly prescribe actions that have quite complex specifications. When teaching programming to students, diagrams are often used in a simple but powerful manner. A picture is drawn representing the initial conditions of a program state. This picture is modified, perhaps several times, until some final goal state is represented. Imperative code is then written, which is shown, usually by waving of hands, to perform transformations on the program's state which are analogous to the transformations that were applied to the diagrams. This thesis began with a simple idea: to provide a formal framework within which we could account for, and subsequently automate, the translation process from diagram sequence to code. We also present a visual programming environment, built upon the framework, which produces working code from sequences of diagrams similar to those found in text books describing basic abstract data type AN operations. As it transpires, the framework which we have developed seems to express a common underlying metaphor which recurs in many uses of sequences of diagrams, which we call homomorphic planning. Homomorphic planning is a technique which allows planning to occur in one domain (which may be diagrammatic), with the resultant plans being applicable in another (which may also be diagrammatic). We outline the criteria that a pair of domains must abide by to perform such a type of planning.
Author
Diagrams; Homomorphisms; Images; Programming Environments

20020074769 Pittsburgh Univ., Dept. of Electrical Engineering, Pittsburgh, PA USA
An Automated Spectral Deconvolution Algorithm: Application to Thermal Infrared Studies of Earth and Mars
Zorn, N. V., Pittsburgh Univ., USA; Ramsey, M. S., Pittsburgh Univ., USA; Solar System Remote Sensing; 2002, pp. 93-94; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The linear mixing of thermal infrared (TIR) emission spectra in multi-mineralic mixtures has been proven, and its limits and applicability have been quantitatively investigated. Limiting factors in the accuracy of any linear retrieval (spectral deconvolution) algorithm include the spectral precision of the instrumentation as well as the fact that the number of end-members must be less than the number of spectral bands in the TIR. Because of this end-member constraint, there is no way to examine a multispectral TIR image using a large, spectral end-member library. A possible solution is the implementation of an automated, blind end-member algorithm to analyze all possible subsets (of arbitrary size k) of minerals present in the mixture from within a mineral library (of size n). For example, in the only such study to employ this technique, the Kelso Dunes, California were examined using 375 unique combinations (k4) of the most likely (n=) 15 minerals present in the dunes. The deconvolution model results were analyzed for their "goodness of fit" to laboratory spectra of collected sand samples. This investigation proved highly successful, further supporting the capabilities of linear retrieval in the TIR. However, the process was computationally intensive

because it was entirely manual. The development of an automated algorithm to accomplish this task would decrease the amount of time required for such an investigation by many orders of magnitude. From a remote sensing perspective, an automated blind end-member spectral deconvolution algorithm could be useful to determine mineral abundance for any mixture (or pixel-by-pixel in a TIR image) using a large emissivity library of minerals as input. This approach is particularly timely as there multispectral TIR mapping instruments now orbiting Earth and Mars.
Author
Infrared Spectra; Algorithms; Thermal Emission; Mineralogy; Multispectral Photography; Photomapping

20020074777 Air Force Research Lab., Air Vehicles Directorate, Wright-Patterson AFB, OH USA
Transitioning to PC-Based Simulation-One Perspective ***Final Report, 1 Aug. 2001-1 May 2002***
Nalepka, Joseph; Dube, Thomas; Williams, Glenn; Snyder, Adam; Danube, Thomas; Jun. 2002; 10p; In English; Presented at Proceedings of AIAA Modeling and Simulation Technologies Conference, 5 Aug. 2002. AIAA-2002-4863
Contract(s)/Grant(s): IN-HOUSE; Proj-232F
Report No.(s): AD-A404956; AFRL-VA-WP-TP-2002-319; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Doing 'more for less' is a recurring theme facing researchers in many simulation facilities. In the area of simulation, one way to reduce operational costs is to invest in and operate inexpensive simulation computer systems. Traditionally, this has not been possible because very specialized computer systems were required to build simulation architectures that provided a deterministic timing mechanism and also assured that simulation processes executed in a predetermined order throughout the entire execution period of the simulation. However, with the advent of 2.0 OHz processors, powerful graphics cards, and the wide availability of software, the personal computer (PC) is now becoming a realistic option for developing real-time simulation architectures. Air Force Research Laboratory (AFRL) researchers at the Aerospace Vehicle Technology Assessment and Simulation (AVTAS) Laboratory have integrated and tested a simple, PC-based, real-time simulation framework that executes under the Linux operating system. Using various hardware- and software-based timing mechanisms, along with nonspecialized software tools, the AVTAS Laboratory has developed a real-time simulation architecture that will enable the execution of simulation experiments on dual-CPU and quad-CPU PCs.
DTIC
Computer Programs; Networks; Multiple Access

20020074779 Carnegie-Mellon Univ., Software Engineering Inst., Pittsburgh, PA USA
Relating the Team Software Process(SM) (TSPSM) to the Capability Maturity Model for Software (SW-CMM)
Davis, Noopur; McHale, Jim; Jun. 2002; 169p; In English
Contract(s)/Grant(s): F19628-00-C-0003
Report No.(s): AD-A404970; CMU/SEI-2002-TR-008; ESC-TR-2002-008; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Organizations using the Capability Maturity Model for Software(registered) (SW-CMM(registered)) to guide their software process improvement efforts often struggle with implementation details. The Team Software Process(Service Mark) (TSP(Service Mark)) was designed to implement effective, high-maturity processes for project teams. The TSP contains a framework as well as a set of processes, procedures, guidelines, and tools for project teams to use in the production of high-quality software on time and on budget. Since the SW-CMM describes what an organization at a high level of process maturity should be doing, and the TSP describes how high-maturity processes are implemented for project teams, the question arises: If all projects in an organization were using the TSP, would the organization exhibit the characteristics of high process maturity, as described in the SW-CMM? To help answer this question, we performed an analysis of the degree to which the SW-CMM is addressed by the TSP. Each key practice described in the SW-CMM was classified as having an organizational or project scope, or both. Then each practice was examined to determine how it was addressed by the TSP. The results presented in this report show that the TSP implements a majority of the key practices of the SW-CMM.
DTIC
Software Engineering; Project Management

20020074787 Modelogics, Inc., Kennesaw, GA USA
Thermal System Analysis Tools (TSAT) ***Final Report, 1 Sep. 1999-31 Dec. 2001***
Hodge, Ernest S.; Glickstein, Marvin R.; Jan. 01, 2002; 47p; In English; Original contains color images
Contract(s)/Grant(s): F33615-99-2-2919; Proj-3048
Report No.(s): AD-A404721; AFRL-PR-WP-TR-2002-2013; No Copyright; Avail: CASI; A03, Hardcopy

Design of military aircraft, or other complex engineering systems, involves designing the individual components and subsystems, and subsequently integrating all of those parts to yield the desired final product. Since the design of a new product (e.g., aircraft, spacecraft, etc.) usually begins with a definition of what the role or mission of the new product will be, the design process can focus on satisfying that mission. This design process, to be efficient, optimizes the total integrated design to best attain its product goal. This process has historically been a lengthy iterative procedure, often not arriving at an optimized, or even a satisfactory design. A new design approach is introduced and developed in this program for design of highly integrated systems. Focusing on one aspect of the total (aircraft) system, namely the thermal management systems, a new method for design, integration, and analytical evaluation is developed and demonstrated. This process allows modeling and simulation of highly integrated complex systems, and top level evaluation of such systems, thereby identifying the effects of subsystem design on the performance of the whole. The new methods are based on the use of object oriented programming methods, with open architect programming methods consistent with the Microsoft COM protocols. The resulting analysis methods are compatible with planned computer industry initiatives for distributed computing, using desktop computing platforms, and offer very powerful new methods for integrated design processes.
DTIC
Aircraft Design; Temperature Control; Design Analysis

20020074793 Secretary of the Air Force, Washington, DC USA
Visual Information (VI) Management
Nov. 16, 2001; 87p; In English
Report No.(s): AD-A404976; AFI33-117; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This change incorporates interim change (IC) 2001-1. It affects the implementation and operation of Local Area Network (LAN)-based Video Teleconferencing (VTC) (LVTC) within the Air Force. LVCT is now authorized for limited use within the Air Force. Restrictions and limitations are in paragraph 2.3.1.2.
DTIC
Management Information Systems; Local Area Networks; Telecommunication

20020074794 Secretary of the Air Force, Washington, DC USA
Software Management
Jul. 01, 2000; 16p; In English
Report No.(s): AD-A404975; AFI33-114; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This instruction provides the guidance and procedures that personnel must use to plan, develop, use, maintain, or support Air Force software to effectively and efficiently complete their assigned missions. It applies to Air Force-procured COTS software and software developed for unique Air Force purposes (other than software internal to a weapon system; see AFPD 63-1). Maintain and dis- pose of records created as a result of the processes described in this instruction in accordance with AFMAN 37-139, Records Disposition Schedulet (will convert to AFI 33-322 Volume 4 AFI 33-322V4).
DTIC
Software Engineering; Management Information Systems

20020074802 Secretary of the Air Force, Washington, DC USA
Enterprise Information Technology Architectures
May 01, 2000; 16p; In English
Report No.(s): AD-A404981; AFI33-124; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
The DoD Information Technology Management Strategic Plan (ITMSP) provides overall DoD guidance for managing information resources. The ITMSP establishes the DoD shared vision for IT, top goals and objectives, measures of performance, and strategies to accomplish the goals.
DTIC
Management Information Systems; Architecture (Computers)

20020074818 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
Software Engineering and Simulation Credibility
Ketcham, Ronald L.; Muessig, Paul R.; Aug. 2001; 8p; In English; Original contains color images
Report No.(s): AD-A405033; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
Most people think of 'validation' as the hallmark of simulation credibility. But some simulations, by their very nature (e.g., mission level models, highly complex physics-based simulations, etc.) are notoriously difficult to validate. There are also

situations in which the process of validation, even if feasible, cannot keep pace with the dynamic nature of simulation evolution, or where the cost of validation data is prohibitively high. Are there any other 'hallmarks' of simulation credibility that can help us in cases like these? This paper demonstrates that significant insights into simulation credibility can be obtained via detailed examination of the software engineering processes and practices by which the simulation was developed and is maintained. The nature and value of good software engineering processes is often unknown, or under-appreciated, by the end-users of simulation results and therefore is often overlooked as a barometer of simulation credibility.
DTIC
Software Engineering; Computerized Simulation; Quality Control

20020074880 National Inst. of Standards and Technology, Computer Security Div., Gaithersburg, MD USA
Guide to the Selection of Anti-Virus Tools and Techniques
Polk, W. T.; Bassham, L. E.; Dec. 1992; 40p; In English
Report No.(s): AD-A405145; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Computer viruses continue to pose a threat to the integrity and availability of computer systems. This is especially true for users of personal computers. A variety of anti-virus tools are now available to help manage this threat. These tools use a wide range of techniques to detect, identify, and remove viruses. This guide provides criteria for judging the functionality, practicality, and convenience of anti-virus tools. It furnishes information which readers can use to determine which tools are best suited to target environments, but it does not weigh the merits of specific tools.
DTIC
Applications Programs (Computers); Computer Viruses; Computer Information Security

20020074886 Memphis Univ., Memphis, TN USA
An Administrative Tool for Distributed Security Task Scheduling
Dunlap, Greg; Dasgupta, Dipankar; Jan. 25, 2002; 9p; In English; Original contains color images
Contract(s)/Grant(s): F30602-00-2-0514
Report No.(s): AD-A405140; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We developed an administrative tool for Distributed Security Scheduling of various security tasks by providing a framework for integration, coordination, and resource sharing of several security technologies. It serves as a wrapper for commercial-off-the-shelf (COTS) security software. This tool will be useful for security administrators for specific security measures and to execute appropriate security tools remotely in a coordinated fashion.
DTIC
Scheduling; Coordination; Security; Software Development Tools

20020074889 Naval Air Warfare Center, Weapons Div., China Lake, CA USA
Cost VS Credibility: How Much V&V Is Enough?
Muessig, Paul R.; Aug. 2001; 14p; In English; Original contains color images
Report No.(s): AD-A405130; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper addresses the perennial issue, 'How much V&V is enough for an accreditation'? or, perhaps more to the point, 'How much do you have to spend to convince someone that your model is any good'?. The answer is discussed in terms of our experience in providing accreditation support for weapons system programs within the Department of Defense (DoD). We begin by describing an integrated V&V process developed by the SMART Project, both in overview and in detailed Work Breakdown Structure (WBS) form. We then describe how V&V tasking over the life of the project was tracked and related to WBS elements, and how average costs of each V&V task and product were developed. A table showing levels of effort (LOEs) and fully loaded costs for each phase of V&V is also presented. The V&V process is then embedded within the context of a five-step accreditation support mechanism, whose focus is on the development of application specific M&S acceptance criteria prior to setting V&V requirements. by relating V&V requirements to objective acceptance criteria, and by structuring the accreditation plan around these requirements, precious V&V resources are not wasted chasing unneeded V&V products. The paper concludes by demonstrating that the cost of establishing M&S credibility is governed by two factors: (1) development of unambiguous M&S acceptance criteria prior to V&V, and (2) the availability of prior V&V results. Absent either of these two factors the cost of accreditation must rise substantially, either due to overscoping of the V&V effort, or to lack of synergism between current and prior accreditation efforts, or both.
DTIC
Cost Analysis; Noble Metals; Embedding; Proving

20020074890 Naval Air Warfare Center, Weapons Div., China Lake, CA USA

Cost Effective VV&A: Five Prerequisites

Muessig, P. R.; Laack, D. R.; Aug. 2001; 10p; In English; Original contains color images

Report No.(s): AD-A405131; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Recent requirements to establish the credibility of the models and simulations (M&S) that are used in Department of Defense (DoD) applications have resulted in the development of several approaches to M&S credibility assessment. Each of these approaches attempts to integrate verification and validation (V&V) activities into a formal process whose products (hopefully) support M&S accreditation. The cost of 'VV&A' activities has not typically been a driving factor in the development of these processes however and their independent and fragmentary development has tended to result in 'point-solution' approaches to the problem of cost-effectiveness. Despite their diversity however many VV&A processes share features in common suggesting that it may be possible to identify the essential elements of cost-effective VV&A. This paper proposes five 'common sense' elements of cost-effective VV&A and describes how each of these elements can contribute to the cost-effectiveness of VV&A processes in general. A comparative analysis of six VV&A processes currently in use to support M&S accreditation for a wide variety of DoD applications is then presented. The analysis reveals that the five elements proposed as essential to cost-effective VV&A do in fact characterize in whole or in substantial part all of the VV&A processes considered. The paper concludes by considering some of the evaluative implications of these findings.

DTIC

Cost Effectiveness; Proving; Costs

20020074904 Naval Air Warfare Center, Weapons Div., China Lake, CA USA

An Integrated Approach to Evaluating Simulation Credibility

Muessig, Paul R.; Laack, Dennis R.; Wrobleski, John J.; Aug. 2001; 13p; In English; Prepared in collaboration with Computer Sciences Corp., Camarillo, CA

Report No.(s): AD-A405051; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Discussions about simulation credibility tend to focus on the issue of 'validation', i.e., how well simulation predictions match real world observations. While validation is certainly a most direct and intuitively accessible measure of simulation credibility, the validation process has numerous well-known limitations. Validation is by no means the only measure of simulation credibility, however. This paper identifies and categorizes a spectrum of information that can be used to evaluate simulation credibility more robustly than reliance on validation results alone. It also describes a method by which the nature, scope and depth of information necessary to establish simulation credibility for a particular application can be determined from an analysis of the risks associated with that application.

DTIC

Computerized Simulation; Program Verification (Computers); Systems Integration; Systems Engineering

20020074989 General Accounting Office, Washington, DC USA

District of Columbia: More Details Needed on Plans to Integrate Computer Systems With the Family Court and Use Federal Funds

Aug. 2002; 34p; In English; Report to Congressional Committees

Report No.(s): AD-A404951; GAO-02-948; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Reviews of the District of Columbia's (the District) Child and Family Services Agency (CFSA) have identified significant problems in the child welfare system. Congress took steps to help address these problems through passage of the D.C. Family Court Act of 2001. This act reformed court practices and established procedures intended to improve interactions between the court and social service agencies in the District. The act also directed the Mayor to prepare a plan for integrating the computer systems of District agencies with those of the Family Court of the Superior Court of the District of Columbia. The fiscal year 2002 D.C. Appropriations Act authorized $200,000 for the completion of a plan on integrating the computer systems and $500,000 for CFSA to use for social workers to implement family court reform. The Appropriations Act also required the Mayor to prepare a plan for the use of these funds and mandated that the plan be issued on July 5, 2002. Additionally, the Appropriations Act required us to analyze the Mayor's plan within 30 days after its issuance. Because the appropriated funds will not be available until after our report is issued, the District used its own funds for the completed activities.

DTIC

Computers; Programs

20020075018 Corps of Engineers, Washington, DC USA
Engineering and Design: Geospatial Data and Systems
Jul. 01, 1998; 116p; In English
Report No.(s): AD-A405177; USACE-EM-1110-1-2909-CHG-2; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This manual provides detailed technical guidance and procedures for compliance with the policy in Engineer Regulation (ER) 1110-1-8156, regarding Geospatial Data and Systems (GD&S) within the U.S. Army Corps of Engineers (USACE).
DTIC
Data Bases; Data Management; Geographic Information Systems

20020075039 Booz-Allen and Hamilton, Inc., McLean, VA USA
Applying Security Patches
Oct. 23, 2001; 87p; In English; Original contains color images
Report No.(s): AD-A405074; No Copyright; Avail: CASI; A05, Hardcopy
Failure to keep operating system and application software up to date is the most common mistake made by information system professionals and users. Unfortunately, despite extensive testing, all operating systems and applications are released with bugs (errors in the software) that affect security, performance and stability. Most estimates for the number of bugs in published software range from 5 up to 20 bugs per 1000 lines of code. Most of these bugs do not represent significant errors and do not affect the performance or security of a system, and therefore are not usually noticed. However, some may have a negative impact on security and performance.
DTIC
Applications Programs (Computers); Computer Systems Performance; Computer Information Security; Computer Viruses

20020075588 Mississippi State Univ., Dept. of Computer Science, Mississippi State, MS USA
The Loci Multidisciplinary Simulation System Overview and Status
Luke, Edward A., Mississippi State Univ., USA; Tong, Xiao-Ling, Mississippi State Univ., USA; Tang, Lin, Mississippi State Univ., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 463-470; In English; Also announced as 20020075551
Contract(s)/Grant(s): NAS13-98033; NSF ITR-00-85969; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC
This paper will discuss the Loci system, an innovative tool for developing tightly coupled multidisciplinary three dimensional simulations. This presentation will overview some of the unique capabilities of the Loci system to automate the assembly of numerical simulations from libraries of fundamental computational components. We will discuss the demonstration of the Loci system on coupled fluid-structure problems related to RBCC propulsion systems.
Author
Three Dimensional Models; Loci; Numerical Analysis; Propulsion System Configurations

20020075589 Mississippi State Univ., Center for Computational Systems, Mississippi State, MS USA
Computational Systems for Multidisciplinary Applications
Soni, Bharat, Mississippi State Univ., USA; Haupt, Tomasz, Mississippi State Univ., USA; Koomullil, Roy, Mississippi State Univ., USA; Luke, Edward, Mississippi State Univ., USA; Thompson, David, Mississippi State Univ., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 471-478; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC
In this paper, we briefly describe our efforts to develop complex simulation systems. We focus first on four key infrastructure items: enterprise computational services, simulation synthesis, geometry modeling and mesh generation, and a fluid flow solver for arbitrary meshes. We conclude by presenting three diverse applications developed using these technologies.
Author
Computational Geometry; Models; Computerized Simulation

20020075711 Single Integrated Air Picture System Engineering Task Force, Arlington, VA USA
Single Integrated Air Picture (SIAP) Progress, Plans, and Recommendations
Mathis, Mike; Dutchyshyn, Harry; Wilson, Jeffery W.; Apr. 2002; 114p; In English
Report No.(s): AD-A404955; SIAP-TR-2002-004; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche
This report responds to USD(AT&L)'s (Under Secretary of Defense (Acquisition, Technology and Logistics) 25 June 2001 tasking to the Single Integrated Air Picture (SIAP) Acquisition Executive. The memorandum requested a report on the Single

Integrated Air Picture System Engineering Task Force's: (1) Progress; (2) Plans to define the SIAP Integrated Architecture, identify and resolve problems with the Joint Data Network (JDN), and define the elements of the Joint Composite Tracking Network (JCTN); and (3) Emerging issues and recommendations. A key driver behind this request stemmed from OASD (C31) and 0USD (AT&L) questions regarding how the DoD would develop a JDN/JCTN road map. Our approach is to use DoD's C4ISR architectural discipline to flow requirements to material alternatives that will define that road map. We began by assuming the proposed JCTN concept represented an accurate, low latency network (Integrated Fire Control (IFC) being one of the key engineering drivers). We expect to have our initial draft of the SIAP architectural framework by December 2002. This report captures key events, ideas and operational factors that drove DoD decisions to establish the SIAP System Engineering Task Force. It outlines the architectural process the Task Force expects to follow in building the architectural framework for the SIAP component of the Theater Air and Missile Defense (TAMD) integrated Architecture - the road map is a piece of this architecture. DTIC

Air Defense; Systems Engineering; Computer Networks; Data Systems; Architecture (Computers)

20020075969 Argonne National Lab., IL USA

Mesquite design: issues in the development of a mesh quality improvement toolkit

Freitag, L.; Leurent, T.; Knupp, P.; Melander, D.; Mar. 26, 2002; 10p; In English

Report No.(s): DE2001-795812; ANL/MCS/CP-107251; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Poor mesh quality is known to adversely affect both solution efficiency and accuracy. There has been considerable research on a wide variety of mesh improvement algorithms, but the impact of these algorithms on applications has been limited because they are typically embedded in particular meshing software packages. to rectify this situation, they are developing a stand-alone mesh quality improvement toolkit called MESQUITE. In this paper, the authors describe the motivation, goals, and design of MESQUITE and give some computational results using the underlying algorithms that show the benefit of such a package. NTIS

Algorithms; Grid Generation (Mathematics); Applications Programs (Computers)

20020076042 Argonne National Lab., IL USA

Creating interoperable meshing and discretization software: the terascale simulation tools and technology center

Brown, D.; Freitag, L.; Glimm, J.; Mar. 26, 2002; 10p; In English

Report No.(s): DE2001-795813; ANL/MCS/CP-107219; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The authors present an overview of the technical objectives of the Terascale Simulation Tools and Technologies center. The primary goal of this multi-institution collaboration is to develop technologies that enable application scientists to easily use multiple mesh and discretization strategies within a single simulation on terascale computers. The discussion focuses on the efforts to create interoperable mesh generation tools, high-order discretization techniques, and adaptive meshing strategies. NTIS

Grid Generation (Mathematics); Computer Programs

20020076095 Real-Time Innovations, Inc., Sunnyvale, CA USA

Control Software

Spinoff 1997; 1997, pp. 110-111; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Real-Time Innovations, Inc. (RTI) collaborated with Ames Research Center, the Jet Propulsion Laboratory and Stanford University to leverage NASA research to produce ControlShell software. RTI is the first "graduate" of Ames Research Center's Technology Commercialization Center. The ControlShell system was used extensively on a cooperative project to enhance the capabilities of a Russian-built Marsokhod rover being evaluated for eventual flight to Mars. RTI's ControlShell is complex, real-time command and control software, capable of processing information and controlling mechanical devices. One ControlShell tool is StethoScope. As a real-time data collection and display tool, StethoScope allows a user to see how a program is running without changing its execution. RTI has successfully applied its software savvy in other arenas, such as telecommunications, networking, video editing, semiconductor manufacturing, automobile systems, and medical imaging. Author

Real Time Operation; Control Equipment; Command and Control; Computer Programs

20020076098 Coryphaeus Software, Inc., Los Gatos, CA USA

Real-Time Simulation

Spinoff 1997; 1997, pp. 98-99; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Coryphaeus Software, founded in 1989 by former NASA electronic engineer Steve Lakowske, creates real-time 3D software. Designer's Workbench, the company flagship product, is a modeling and simulation tool for the development of both static and dynamic 3D databases. Other products soon followed. Activation, specifically designed for game developers, allows developers to play and test the 3D games before they commit to a target platform. Game publishers can shorten development time and prove the "playability" of the title, maximizing their chances of introducing a smash hit. Another product, EasyT, lets users create massive, realistic representation of Earth terrains that can be viewed and traversed in real time. Finally, EasyScene software control the actions among interactive objects within a virtual world. Coryphaeus products are used on Silican Graphics workstation and supercomputers to simulate real-world performance in synthetic environments. Customers include aerospace, aviation, architectural and engineering firms, game developers, and the entertainment industry.

Author

Three Dimensional Models; Computerized Simulation; Games; Terrain; Data Bases

20020076117 Synopsys, Inc., Advanced Technology Group, Mountain View, CA USA

Nimble Compiler Environment for Agile Hardware. Volume 1 ***Final Report, 1 Apr. 1998-24 Jul. 2001***

MacMillen, Don; Oct. 2001; 232p; In English; Original contains color images

Contract(s)/Grant(s): F33615-98-2-1317; Proj-ARPI

Report No.(s): AD-A405143; AFRL-IF-WP-TR-2002-1536; No Copyright; Avail: CASI; A11, Hardcopy

The utilization of a tightly coupled general purpose processor (GPP) and reconfigurable logic array (RLA) has demonstrated appreciable acceleration in some computer intensive applications. Such systems have been very difficult to program though and thus have not been exploited for their benefits. The problem is the lack of an appropriate design environment for system engineers like those typically found in digital signal processing (DSP) embedded system development. The Nimble Compiler research project aims to develop a retargetable design compiler for these adaptable architectures that will exploit the performance gains and hardware whenever it is needed as opposed to being predesigned into hardware. Field updates or modal changes in function are simple. Embedded applications across a wide spectrum of programming language styles will be targeted for support. The resultant environment should accelerate adoption of these computing platforms by making the systems easier to develop and more robust to multiple standards. The Government benefits from this effort by enabling the compute intensive portions of military electronic systems to be smaller, cheaper, and field upgradeable.

DTIC

Compilers; Computer Techniques; Programming Languages; Embedding

20020076130 Analysis and Simulation, Inc., Buffalo, NY USA

Personalized Learning Software

Spinoff 1997; 1997, pp. 84-85; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Analysis and Simulation Inc. products, IEPLANNER and TPLAN, make use of C Language Integrated Production System (CLIPS), a NASA-developed expert system shell which originated at Johnson Space Center. Both products are interactive computer-based systems. They can be run independently or together as one complete system. Utilized as an Individual Education Plan tool, a user of IEPLANNER and TPLAN can define a goals list, while identifying a host of student demands in motor skills, socials skills, life skills, even legal and leisure needs in the user's area. This computerized, expert tutor and advisor allows assessment of the status of the student and the degree to which his/her needs are being met. NASA Small Business Innovation Research contracts have also supported the company Human Memory Extension technology and the creation of a World Wide Web 3D browser.

Author

C (Programming Language); Computer Programs; Computer Techniques; Expert Systems

20020076139 Design, Analysis and Research Corp., Lawrence, KS USA

Aviation Design Software

Spinoff 1997; 1997, pp. 60; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

DARcorporation developed a General Aviation CAD package through a Small Business Innovation Research contract from Langley Research Center. This affordable, user-friendly preliminary design system for General Aviation aircraft runs on the popular 486 IBM-compatible personal computers. Individuals taking the home-built approach, small manufacturers of General Aviation airplanes, as well as students and others interested in the analysis and design of aircraft are possible users of the package. The software can cut design and development time in half.
Author
Aircraft Design; Computer Aided Design; Computer Programs

20020076162 Tennessee Univ., Chattanooga, TN USA
Desktop Computer Displays: A Life-Cycle Assessment, Volume 1
Socolof, M. L.; Overly, J. G.; Kincaid, L. E.; Geibig, J. R.; Dec. 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-108877; EPA/744/R-01/004A-Vol-1; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this study is two-fold: (1) to establish a scientific baseline that evaluates the life-cycle environmental impacts of active matrix liquid crystal display (LCD) and cathode ray tube (CRT) technologies for desktop computers, by combining LCA and CTSA methodologies; and (2) to develop a model that can be used with updated data for future lifecycle analyses. This study is designed to provide the electronics industry with information needed to improve the environmental attributes of desktop computer displays. The evaluation considers impacts related to material consumption, energy, air resources, water resources, landfills, human toxicity, and ecological toxicity.
NTIS
Cathode Ray Tubes; Liquid Crystals; Display Devices; Toxicity; Water Resources; Ecology

20020076212 Fourth Planet, Inc., Santa Clara, CA USA
Real-Time 3D Visualization
Spinoff 1997; 1997, pp. 106; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Butler Hine, former director of the Intelligent Mechanism Group (IMG) at Ames Research Center, and five others partnered to start Fourth Planet, Inc., a visualization company that specializes in the intuitive visual representation of dynamic, real-time data over the Internet and Intranet. Over a five-year period, the then NASA researchers performed ten robotic field missions in harsh climes to mimic the end- to-end operations of automated vehicles trekking across another world under control from Earth. The core software technology for these missions was the Virtual Environment Vehicle Interface (VEVI). Fourth Planet has released VEVI4, the fourth generation of the VEVI software, and NetVision. VEVI4 is a cutting-edge computer graphics simulation and remote control applications tool. The NetVision package allows large companies to view and analyze in virtual 3D space such things as the health or performance of their computer network or locate a trouble spot on an electric power grid. Other products are forthcoming. Fourth Planet is currently part of the NASA/Ames Technology Commercialization Center, a business incubator for start-up companies.
Author
Virtual Reality; Three Dimensional Models; Real Time Operation; Computer Graphics

20020076244 Expert Microsystems, Inc., Orangevale, CA USA
Sensor Validation Software
Spinoff 1997; 1997, pp. 70; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Under a Small Business Innovation Research contract from Lewis Research Center, Expert Microsystems, Inc. developed SureSense, real-time sensor data validation software. This ultra-reliable control and sensing system product was produced through a partnership in 1994 between Expert Microsystems and Intelligent Software Associates, Inc. SureSense was created in response to a NASA need for verifying the reliability of sensor input that operated advanced automation and control systems. The immediate applications included improving the safety and reliability of Space Shuttle Main Engine operations. The company has structured the software to enable application to virtually any process control environment, such as computer integrated manufacturing, power plants, and hazardous gas sensing and control systems.
Author
Real Time Operation; Manufacturing; Computer Programs; Data Management; Gas Analysis

20020076306 Rutherford Appleton Lab., Computational Science and Engineering Dept., Chilton, UK

Sparse BLAS

Duff, I. S.; Heroux, M. A.; Pozo, R.; Sep. 24, 2001; 44p; In English

Report No.(s): PB2002-106051; RAL-TR-2001-032; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The authors the interference design for the Sparse Basic Linear Algebra Subprograms (BLAS), the kernels in the recent standard from the BLAS Technical Forum that are concerned with unstructured sparse matrices. The motivation for such a standard is to encourage portable programming while allowing for the library-specific optimizations. In particular, the authors show how this interface can shield one from concern over the specific storage scheme for the sparse matrix. This design makes it easy to add further functionality to the sparse BLAS in the future. The authors illustrate the use of the Sparse BLAS with examples in three supported programming languages, FORTRAN 95, FORTRAN 77, and C.

NTIS

Computer Programming; Linearity; Algebra; Matrices (Mathematics); Subroutines

20020076396 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

Requirements Engineering for Software Integrity and Safety ***Final Report, 1 Oct. 1999 - 30 Sep. 2002***

Leveson, Nancy G., Massachusetts Inst. of Tech., USA; [2002]; 3p; In English

Contract(s)/Grant(s): NAG1-2239

Report No.(s): MIT-OSP-6890065; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Requirements flaws are the most common cause of errors and software-related accidents in operational software. Most aerospace firms list requirements as one of their most important outstanding software development problems and all of the recent, NASA spacecraft losses related to software (including the highly publicized Mars Program failures) can be traced to requirements flaws. In light of these facts, it is surprising that relatively little research is devoted to requirements in contrast with other software engineering topics. The research proposed built on our previous work. including both criteria for determining whether a requirements specification is acceptably complete and a new approach to structuring system specifications called Intent Specifications. This grant was to fund basic research on how these ideas could be extended to leverage innovative approaches to the problems of (1) reducing the impact of changing requirements, (2) finding requirements specification flaws early through formal and informal analysis, and (3) avoiding common flaws entirely through appropriate requirements specification language design.

Author

Software Engineering; Software Reliability; Reliability Analysis; Computer Programs

20020077953 Binghamton Univ., Dept. of Electrical Engineering, Binghamton, NY USA

UNIPASS for AvSP? A Broader View

Wu, N. Eva, Binghamton Univ., USA; Aug. 14, 2001; 11p; In English

Contract(s)/Grant(s): NCC1-336; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

UNIPASS is a general-purpose probabilistic computer program consisting of three major modules, including preprocessor, solver and postprocessor. UNIPASS contains a user-friendly Graphical User Interface (GUI), numerous state-of-the-art probabilistic analysis techniques, a large library of statistical distributions and a function module with a large library of support functions that can easily define any complex limit-state function in a scripting FORTRAN-like syntax format. Its inverse probability analysis and sensitivities analysis capabilities make it a powerful design aid in any product cycle. Its precise numerical analysis engine is accurate enough to push the failure probabilities of a design to well below 10 (exp -50). UNIPASS is equipped with advanced artificial intelligence that is designed to handle systems with an essentially unlimited number of random variables with ease and efficiency. Its modular arrangement allows you to tailor an analysis to the desired level of accuracy and efficiency. The depth and comprehensiveness of UNIPASS are built upon the decades of experience and expertise of industry leaders including Boeing Aircraft, NASA and the DoD. Its rich content also makes UNIPASS a valuable instructional tool for random processes and probabilistic mechanics. The topics include: 1) Reliability in AvSP; 2) Role of UNIPASS in AvSP; and 3) Examples. This paper is in viewgraph form.

CASI

Artificial Intelligence; Computer Systems Programs; Probability Theory; Reliability Analysis; Multiprocessing (Computers)

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.

20020074381 Secretary of the Air Force, Washington, DC USA
Communications and Information. Communications Security: Protected Distribution Systems (PDS)
Bohl, Dwight; Dec. 11, 2000; 31p; In English
Report No.(s): AD-A404837; AFM33-221; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Air Force Instruction (AFI) 33-201, (FOUO) Communications Security (COMSEC) , requires the use of National Security Agency (NSA)-endorsed communications security (COMSEC) products and services to secure classified telecommunications by all Air Force activities and their contractors. Information systems or networks that process classified national security information in more than one controlled access area (CAA) and require the transfer of that information between CAAs, must use a secure means of transference--secure telecommunications or courier. If secure telecommunications is chosen, include a secure telecommunications requirement (COMSEC) in the systems security policy. In order of preference, the COMSEC requirement is met by: NSA-endorsed COMSEC systems (encryption), NSA-endorsed intrusion detection optical communications system (IDOCS), or a protected distribution system (PDS). AFI 33-201 also requires the use of NSA-endorsed COMSEC products, techniques, and protected services to protect certain unclassified, sensitive telecommunications involving Air Force activities and their contractors. When certain unclassified, sensitive information must be protected, and a PDS is chosen, follow the standards in this manual for CONFIDENTIAL information.
DTIC
Information Systems; Security; Telecommunication; Warning Systems

20020074586 General Accounting Office, Washington, DC USA
EXPORT CONTROLS: More Thorough Analysis Needed to Justify Changes in High Performance Computer Controls
Aug. 2002; 36p; In English; Report to Congressional Committees
Report No.(s): AD-A404839; GAO-02-892; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In January 2002, the President announced that the control threshold above which computers exported to countries such as China, India, and Russia would increase from 85,000 MTOPS to 190,000 MTOPS. When the President changes the threshold, the National Defense Authorization Act of 1998 requires that the President provide a justification to Congress. The justification should, at a minimum, address the extent to which computers capable of performance between the established and newly proposed level of performance are available from other countries, address all their potential military uses, and assess the impact of such uses on U.S. national security interests. A related law also requires that we assess the executive branch's proposed changes. The justification for the President's January 2002 change to the control threshold for high performance computers was presented in a December 28, 2001, report to Congress. Thus, we (1) assessed the President's justification for the decision as presented in the December 2001 report and (2) identified other issues relevant to the decision to change the control threshold. to address these issues, we reviewed the statutory requirements for the justification, the documentation used by executive branch officials to support the conclusions presented in the report, and export control regulations pertaining to high performance computers. In addition, we obtained information from the 10 manufacturers listed in the President's report on the availability of high performance computers having the specifications described in the report. The information obtained from the manufacturers was supplemented with additional information obtained from a leading information technology industry market research organization. We also interviewed officials from the Departments of Commerce, Defense, and State who were responsible for producing the President's report.
DTIC
Computers; Regulations; International Trade; Information Systems

20020074774 Naval Postgraduate School, Monterey, CA USA
Research in Computer Forensics
Wai, Hor C.; Jun. 2002; 205p; In English; Original contains color images
Report No.(s): AD-A404953; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Computer Forensics involves the preservation, identification, extraction and documentation of computer evidence stored in the form of magnetically encoded information. With the proliferation of E-commerce initiatives and the increasing criminal activities on the web, this area of study is catching on in the IT industry and among the law enforcement agencies. The objective of the study is to explore the techniques of computer forensics from the computer security perspective. Specifically, the thesis

looks into the application of forensic principles and techniques, security designs of computer hardware and software, and network protocols, in an effort to discover the trails of the computer hackers. The theses subsequently packages this knowledge into a curriculum for a twelve weeks resident course at the Naval Postgraduate School. Complementing the research and course materials are surveys conducted on agencies and vendors currently providing computer forensic courses and training, reading materials, and software tools applicable to computer forensic investigation. The purpose of these surveys is to provide a depository of useful information related to the specialized discipline of computer security.
DTIC
Computer Information Security; Crime

20020074788 Marine Corps Combat Development Command, Quantico, VA USA
Information Warfare: Issues Associated with the Defense of DOD Computers and Computer Networks
Franklin, Derek L.; Apr. 12, 2002; 62p; In English; Original contains color images
Report No.(s): AD-A404740; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The threat to the Defense Information Infrastructure is growing. Hackers have advanced in sophistication and the potential exists for an alliance of independent hackers and terrorist/criminal groups that may threaten the critical information pathways of the armed forces. An analysis of the history of computer information warfare reveals that there was an embarrassing lack of readiness and defense capability available to the armed forces of the USA before 1999. With the establishment of the Joint Task Force-Computer Network Defense (JTF-CND) later renamed to Computer Network Operations in 1998 (JTF-CNO), a minimum capacity to respond has been developed. However, as the issue has grown in importance, policy makers and planners have come to realize the limitations of Computer Network Attack (CNA) and Computer Network Defense (CND) as warfare areas. The growth of related legal and law enforcement issues, and the effect of a possible enemy CNA strike, will require the coordination of civilian, armed forces, and law enforcement officials to respond effectively. This will prevent CNA/CND from being a purely military issue.
DTIC
Computer Networks; Computer Information Security; Armed Forces (USA)

20020074791 Secretary of the Air Force, Washington, DC USA
Electronic Mail (E-Mail) Management and Use
Mar. 01, 1999; 30p; In English; Original contains color images
Report No.(s): AD-A404978; AFI33-119-Rev; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document is substantially revised and must be completely reviewed. This revision updates the entire instruction. Paragraph 2. includes establishing organizational and individual E-mail accounts. Paragraph 3. differentiates between acceptable and unacceptable use of E-mail. Paragraph 4. includes a reference to "//SIGNED//" in the signature blocks. Paragraph 5. includes standard naming conventions for Air Force-owned and maintained messaging systems and Air Force-operated Defense Messaging System equipment. The ( ) preceding the title indicates a major revision from the previous edition.
DTIC
Management Information Systems; Electronic Mail

20020074792 Secretary of the Air Force, Washington, DC USA
Communications and Information: Communications Security (COMSEC) User Requirements
Nov. 01, 1997; 45p; In English
Report No.(s): AD-A404977; AFI33-211; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This AFI sets procedures for CROs and COMSEC users. It describes their COMSEC duties and the minimum requirements for safeguarding, controlling, and destroying COMSEC material routinely and during an emergency. Controls apply to accessing, using, producing, developing, moving, storing, accounting for, and disposing of COMSEC material. This AFI also describes the two-person integrity (TPI) policy and procedures for all Top Secret COMSEC key and Top Secret key-generating equipment. It contains general COMSEC information of interest to all CROs and COMSEC users who receive COMSEC aids.
DTIC
Education; Scrambling (Communication)

20020074800 Secretary of the Air Force, Washington, DC USA
Communications and Information: Identification and Authentication
Jun. 01, 1998; 17p; In English; Supersedes AFSSI 5013, dated 1 Jul. 1996
Report No.(s): AD-A404983; AFM33-223; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This manual provides information system users, system administrators, workgroup managers, and CSSOs with proper identification and authentication (I&A) procedures. 'Identification' is the process where individuals identify themselves to a system as a valid user. "Authentication" is the procedure where the system verifies the user has a right to access the system User identifications (user-ID) and passwords, because of their cost-efficiency and ease of implementation, are the most common I&A method. Because of their vulnerability to interception or inadvertent disclosure, they are also the weakest of I&A methods. Passwords are only effective when used properly. Inappropriate passwords create some of today's most common information system vulnerabilities.
DTIC
Information Systems; Computer Information Security; Program Verification (Computers)

20020074990 Secretary of the Air Force, Washington, DC USA
Computer Security Assistance Program
Sep. 01, 1997; 6p; In English
Report No.(s): AD-A404996; AFI33-207; No Copyright; Avail: CASI; A01, Microfiche; A02, Hardcopy
This instruction establishes the CSAP (Computer Security Assistance Program) and lists responsibilities for applicable organizations. The CSAP supports the Air Force Information Protection (IP) program.
Derived from text
Computer Programs; Computer Information Security

20020074991 Caliber Associates, Fairfax, VA USA
Training on the Web: Identifying and Authenticating Learners ***Final Report, Apr. 2001-Mar. 2002***
Curnow, Christina K.; Freeman, Michael W.; Wisher, Robert A.; Belanich, James; Jun. 2002; 41p; In English
Contract(s)/Grant(s): DASW01-98-D-0049; Proj-C730
Report No.(s): AD-A405005; ARI-SR-2002-07; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
Soldiers who receive training in the workplace, at their residences, or at other sites outside the traditional classroom increasingly rely upon asynchronous distributed learning systems. This accentuates the need to identify various forms of training compromise, such as obtaining questions beforehand or enlisting a proxy for test taking in non-proctored, web-based learning environments. A one-day workshop, summarized in this report, was conducted to identify practical solutions to training compromise on the Web or military intranets. Experts from government, academia, and industry generated solutions in the areas of test security, biometrics (including fingerprint identification, face recognition, iris scanning, and hand writing recognition), legal issues, public key infrastructure, instructional design, and test design. Following the workshop, an Army advisory group prioritized the solutions into a final list of recommendations, included here as a starting point for addressing and preventing training compromise.
DTIC
Education; Personnel; World Wide Web; Armed Forces (USA)

20020074997 Secretary of the Air Force, Washington, DC USA
Communications and Information: Computer Security
Aug. 30, 2001; 85p; In English
Report No.(s): AD-A405011; AFI33-202; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche
This instruction gives the directive requirements for the COMPUSEC component of the information assurance (IA) discipline as outlined in AFPD 33-2 and implements the Air Force COMPUSEC Program. This instruction applies to all Air Force military and civilian personnel and to Air Force contractors who develop, acquire, deliver, use, operate, or manage Air Force information systems. COMPUSEC is one of the IA disciplines promulgated in AFPD 33-2. Compliance assures measures are taken to protect all Air Force information system resources and information effectively and efficiently. Appropriate levels of protection against threats and vulnerabilities for information systems prevent denial of service, corruption, compromise, fraud, waste, and abuse. Applicability. More restrictive DoDD and Director of Central Intelligence Agency directive requirements governing Special Category information or Special Access Program information take precedence over this.
DTIC
Computer Information Security; Information Systems

20020075031 Department of Defense, Office of the Inspector General, Arlington, VA USA

Information System Security: User Authentication Protection at Central Design Activities

Brinkman, David A.; Stavenjord, Kenneth H.; Johnson, Peter C.; Jul. 29, 2002; 21p; In English

Report No.(s): AD-A405067; IG/DOD-D-2002-135; XD-OASD/C3I; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Officials and administrators who are responsible for DoD information systems should read this report. The report explains the extent of transmitting user passwords in plain text while accessing software development environments and the vulnerabilities associated with it. A Central Design Activity is defined as a designated organization within a Component that has responsibility for designing, converting, programming, testing, documenting, or subsequently maintaining computer operating or applications software for use at more than one location. We evaluated authentication protection at an Army, a Navy, and an Air Force Central Design Activity. Central Design Activities use software development environments to develop and maintain the software for which they are responsible. A software development environment is an integrated suite of tools to aid the development of software in a particular programming language or for a particular application. Logging on to the vast majority of computing systems, including software development environments, is protected by passwords. The person logging on must supply a user name plus the password associated with that user name. The system evaluates the password to verify the user's identity claim. This process is called authentication. Password authentication mechanisms work if passwords are kept secret at all stages. During a previous evaluation, we confirmed at one central design activity that user names and passwords were transmitted in plain text to software development environments located at the Defense Information Systems Agency Defense Enterprise Computing Centers. Readily available software would permit an attacker to capture the transmitted user name and password for possible unauthorized accesses. DTIC

Computer Information Security; Software Engineering; Applications Programs (Computers); Computer Programming

20020076113 Purdue Univ., School of Industrial Engineering, West Lafayette, IN USA

Design Issues for Information Assurance with Agents: Coordination Protocols and Role Combination in Agents

Ang, Chwee B.; Nof, Shimon Y.; Feb. 2001; 25p; In English; Original contains color images

Report No.(s): AD-A405072; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report is a consolidation of work that has been done to fulfill the goals defined in the CERIAS Research Proposal, 'Active Protocols and Agents for Information Assurance in Networked Enterprises'. According to the proposal, the development of an agent System for information assurance will follow two Stages: Design of active, combined task and assurance protocols Development of active, secure task autonomous agents Part I of the report deals with the issues involved in the design of a protocol for an agent system. An agent protocol is viewed as a coordination structure between agents whose design will affect the effectiveness and efficiency of the assurance system. Subsequently, three techniques of coordination are studied: organizational structures, meta-level information exchange and multi-agent planning. It was noted in the study that the different coordination structures affect.

DTIC

Protocol (Computers); Management Information Systems; Computer Networks; Autonomy; Detectors

20020076376 Thomas Jefferson National Accelerator Facility, Newport News, VA USA

Storage Manager and File Transfer Web Services

Watson, W. A.; Chen, Y.; Chen, J.; Akers, W.; Jul. 01, 2002; 10p; In English

Report No.(s): DE2001-797637; JLAB-ADM-02-01; DOE/ER/40150-2121; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Web services are emerging as an interesting mechanism for a wide range of grid services, particularly those focused upon information services and control. When coupled with efficient data transfer services, they provide a powerful mechanism for building a flexible, open, extensible data grid for science applications. In this paper we present our prototype work on a Java Storage Resource Manager (JSRM) web service and a Java Reliable File Transfer (JRFT) web service. A java client (Grid File Manager) on top of JSRM and is developed to demonstrate the capabilities of these web services. The purpose of this work is to show the extent to which SOAP based web services are an appropriate direction for building a grid-wide data management system, and eventually grid-based portals.

NTIS

Data Storage; Data Management; Java (Programming Language); Management Systems; Client Server Systems

20020076388 Thomas Jefferson National Accelerator Facility, Newport News, VA USA

Web Services Data Analysis Grid

Watson, W. A.; Bird, I.; Chen, J.; Hess, B.; Kowalski, A.; Jul. 01, 2002; 10p; In English

Report No.(s): DE2001-797638; JLAB-ADM-02-02; DOE/ER/40150-2122; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The trend in large-scale scientific data analysis is to exploit compute, storage and other resources located at multiple sites, and to make those resources accessible to the scientist as if they were a single, coherent system. Web technologies driven by the huge and rapidly growing electronic commerce industry provide valuable components to speed the deployment of such sophisticated systems. Jefferson Lab, where several hundred terabytes of experimental data are acquired each year, is in the process of developing a web-based distributed system for data analysis and management. The essential aspects of this system are a distributed data grid (site independent access to experiment, simulation and model data) and a distributed batch system, augmented with various supervisory and management capabilities, and integrated using Java and XML-based web services.

NTIS

Computer Networks; Systems Analysis; Data Processing

63
CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

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

20020074891 Army Tank-Automotive and Armaments Command, Warren, MI USA

Fuzzy Logic Based Image Fusion ***Final Report***

Meitzler, Thomas J.; Bednarz, David; Sohn, E. J.; Lane, Kimberly; Bryk, Darryl; Jul. 12, 2002; 9p; In English; Prepared in collaboration with Wayne State Univ., Detroit, MI, and Ford Motor Co., Dearborn, MI

Report No.(s): AD-A405123; TACOM-TP-13818; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The fusion of visual and infrared sensor images of potential driving hazards in static infrared and visual scenes is computed using the Fuzzy Logic Approach (FLA). The FLA is presented as a new method for combining images from different sensors for achieving an image that displays more information than either image separately. Both Mamdani and ANFIS methods are used. The fused sensor images are compared to metrics to measure the increased perception of a driving hazard in the sensor-fused image. The metrics are correlated to experimental ranking of the image quality. The image rankings are obtained by presenting imagery in the TARDEC Visual Perception Lab (VPL) to subjects. Probability of detection of a driving hazard is computed using data obtained in observer tests.

DTIC

Image Processing; Image Resolution; Visual Perception; Display Devices; Fuzzy Systems

20020075724 Air Force Inst. of Tech., School of Engineering and Management, Wright-Patterson AFB, OH USA

A Combined Adaptive Tabu Search and Set Partitioning Approach for the Crew Scheduling Problem with an Air Tanker Crew Application

Combs, Todd E.; Aug. 15, 2002; 174p; In English; Original contains color images

Report No.(s): AD-A405195; AFIT/DS/ENS/02-04; No Copyright; Avail: CASI; A08, Hardcopy

This research develops the first metaheuristic approach to the complete air crew scheduling problem. It develops the first dynamic, integrated, set-partitioning based vocabulary scheme for metaheuristic search. Since no benchmark flight schedules exist for the tanker crew scheduling problem, this research defines and develops a Java(Trademark) based flight schedule generator. The robustness of the tabu search algorithms is judged by testing them using designed experiments. An integer program is developed to calculate lower bounds for the tanker crew scheduling problem objectives and to measure the overall quality of solutions produced by the developed algorithms.

DTIC

Flight Crews; Scheduling

64
NUMERICAL ANALYSIS

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

20020074607 New South Wales Univ., School of Electrical Engineering and Telecommunications, Australia
MAKING WAVELETS: Custom Designing 2-Channel Filter Banks with Associated Biorthogonal Wavelet Bases in L(sup 2)(R)
McDarby, Gary Francis, New South Wales Univ., Australia; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Wavelet theory has made available to the signal-processing world a whole new set of basis functions for representing signals. These basis functions can have various properties like, symmetry, orthogonality, localised support in the time and frequency domains, high order vanishing moments and simple transform implementations via filter banks. A question now is that given the availability of all these new basis functions, how do we choose a wavelet basis for our signals? This study looks at how biorthogonal L(sup 2)(R) wavelets can be designed to suit a particular signal or application using the lifting scheme. Biorthogonal wavelets are chosen over orthogonal wavelets as the associated filter bank can be made up of linear phase filters and the lifting scheme can be used to design the filter bank. Existence of biorthogonal wavelets in L(sup 2) (R) associated with a perfect reconstruction two channel filter bank is governed by the eigenvalues of the Lawton matrices associated with the low pass filters in the filter bank. Each Lawton matrix must be stable in the sense that it must have a single eigenvalue at one and the remaining eigenvalues have to be less than one in modulus. We develop some necessary conditions on the Lawton matrices and on the lifting scheme for stability. We formulate a conjecture that states how a perturbed stable Lawton matrix obeying these necessary conditions becomes unstable. From the conjecture (which has recently been proved), a novel algorithm is developed using the lifting scheme which guarantees the existence of an L(sup 2) (R) wavelet at each lifting step. The algorithm begins with a filter bank that is known to have an associated wavelet and new wavelets are constructed in a way that minimizes a known performance measurement. We present some results using this new algorithm in the domains of ECG and image compression, where the performance measurement is the percentage root mean square difference between the original signal and the reconstructed compressed signal. The algorithm is generic and is not limited to these domains.
Author
Algorithms; Eigenvalues; Linear Filters; Matrices (Mathematics); Orthogonality; Signal Processing

20020074776 Air Force Research Lab., Air Vehicles Directorate, Wright-Patterson AFB, OH USA
Implementing Families of Implicit Chebyshev Methods with Exact Coefficients for the Numerical Integration of First- and Second-Order Differential Equations ***Final Report, 1 Jan.-1 May 2002***
Mitchell, Jason W.; May 2002; 206p; In English; Original contains color images
Contract(s)/Grant(s): Proj-2304
Report No.(s): AD-A404958; AFRL-VA-WP-TR-2002-3053; AFRL-VA-WP-TR-2002-3053; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

A method is presented for the generation of exact numerical coefficients found in two families of implicit Chebyshev methods for the numerical integration of first- and second-order ordinary differential equations. The exact coefficients are represented as algebraic numbers, those numbers that solve polynomial equations with rational coefficients, and are written in nested radical from when possible. In addition to the integration weights, the intra-nodal locations required by the implicit methods are computed. These exact coefficients provide a convenient way to obtain accurate floating-point weights for an integration method of given degree with respect to a specific floating-point precision.
DTIC
Numerical Integration; Polynomials

20020074843 Naval Postgraduate School, Monterey, CA USA
Constructing Higher-Order De Bruijn Graphs
Hunt, D'Hania J.; Jun. 2002; 61p; In English; Original contains color images
Report No.(s): AD-A404934; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We construct binary de Bruijn graphs of odd order using recursive generation. We also explore the properties and nuances of these particular graphs. The recursive method developed for this thesis could in principle be used for other de Bruijn graphs of a different order. Suggestions on how this is accomplished are included in the paper and areas of further research topics.
DTIC
Recursive Functions; Graphs (Charts); Sequential Analysis

20020074982 NASA Langley Research Center, Hampton, VA USA

On Accuracy of Adaptive Grid Methods for Captured Shocks

Yamaleev, Nail K., National Academy of Sciences - National Research Council, USA; Carpenter, Mark H., NASA Langley Research Center, USA; August 2002; 42p; In English

Contract(s)/Grant(s): RTOP 706-31-11-03

Report No.(s): NASA/TM-2002-211415; NAS 1.15:211415; L-18137; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The accuracy of two grid adaptation strategies, grid redistribution and local grid refinement, is examined by solving the 2-D Euler equations for the supersonic steady flow around a cylinder. Second- and fourth-order linear finite difference shock-capturing schemes, based on the Lax-Friedrichs flux splitting, are used to discretize the governing equations. The grid refinement study shows that for the second-order scheme, neither grid adaptation strategy improves the numerical solution accuracy compared to that calculated on a uniform grid with the same number of grid points. For the fourth-order scheme, the dominant first-order error component is reduced by the grid adaptation, while the design-order error component drastically increases because of the grid nonuniformity. As a result, both grid adaptation techniques improve the numerical solution accuracy only on the coarsest mesh or on very fine grids that are seldom found in practical applications because of the computational cost involved. Similar error behavior has been obtained for the pressure integral across the shock. A simple analysis shows that both grid adaptation strategies are not without penalties in the numerical solution accuracy. Based on these results, a new grid adaptation criterion for captured shocks is proposed.

Author

Computational Grids; Finite Difference Theory; Accuracy; Steady Flow; Supersonic Flow

20020075015 Naval Research Lab., Washington, DC USA

Numerical Simulation of Solid Combustion with a Robust Conjugate-Gradient Solution for Pressure

Wang, Yi-Zun J.; Ananth, Ramagopal; Tatem, Patricia A.; Jul. 31, 2002; 25p; In English; Original contains color images

Report No.(s): AD-A405183; NRL/MR/6180--02-8627; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A Bi-Conjugate Gradient method (Bi-CGSTAB) is studied and tested for solid combustion in which the gas and solid phases are coupled by a set of conditions describing mass, momentum and heat transport across the interface. The conjugate gradient method is found to yield robust solutions for pressure and lead to accurate prediction of the burning rates along the length of the polymer plate. Specifically, the conjugate gradient method is significantly simpler with faster convergence that the multi-grid method (MOlD) for a given accuracy in the predicted burning rates.

DTIC

Combustion; Numerical Analysis

20020076037 Technische Univ., Delft, Netherlands

Conditions for the Structural Existence of an Eigenvalue of a Bipartite (min,max,+) System

van der Woude, J.; 1998; 26p; In English

Report No.(s): PB2002-105060; REPT-98-47; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

In this paper the authors consider bipartitie (min, max, +)-systems. The authors present conditions for the structural existence of an eigenvalue and corresponding eigenvector for such systems, where both the eigenvalue and eigenvector are supposed to be finite. The conditions are stated in terms of the system matrices that describe a bipartite (min, max, +)-system. Structural in the previous means that not so much the numerical values of the finite entries in the system matrices are important, rather than their locations within these matrices. The conditions presented in this paper can be seen as a version for bipartite (min, max, +), systems of known conditions for the structural existence of an eigenvalue of a (max, +)-system involving the (ir)reductibility of the associated of the associated systems matrix.

NTIS

Eigenvalues; Eigenvectors; Matrices (Mathematics); Algebra

20020076352 Technische Univ., Delft, Netherlands

Differential Equations for Generalized Jacobi Polynomials

Koekoek, J.; Koekoek, R.; 1998; 42p; In English

Report No.(s): PB2002-105046; REPT-98-42; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Contents include the following: Introduction; The main results; The classical Jacobi polynomials; some inversion, summation and transformation formulas, the generalized Jacobi polynomials; the existence and uniqueness of the differential equation and the eigenvalue coefficients; and the computation of the other coefficients.
NTIS
Differential Equations; Polynomials; Hypergeometric Functions; Eigenvalues

20020076392 NASA Ames Research Center, Moffett Field, CA USA
Triangle Geometry Processing for Surface Modeling and Cartesian Grid Generation
Aftosmis, Michael J., Inventor, NASA Ames Research Center, USA; Melton, John E., Inventor, NASA Ames Research Center, USA; Berger, Marsha J., Inventor, NASA Ames Research Center, USA; Sep. 03, 2002; 18p; In Belorussian, Cameroon; Provisional US-Patent-Appl-SN-068846, filed 29 Dec. 1997
Patent Info.: Filed 24 Dec. 1998; NASA-Case-ARC-14275-1; US-Patent-6,445,390; US Patent-Appl-SN-226673; US-Patent-Appl-SN-068846; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cartesian mesh generation is accomplished for component based geometries, by intersecting components subject to mesh generation to extract wetted surfaces with a geometry engine using adaptive precision arithmetic in a system which automatically breaks ties with respect to geometric degeneracies. During volume mesh generation, intersected surface triangulations are received to enable mesh generation with cell division of an initially coarse grid. The hexagonal cells are resolved, preserving the ability to directionally divide cells which are locally well aligned.
Official Gazette of the U.S. Patent and Trademark Office
Grid Generation (Mathematics); Cartesian Coordinates

20020076394 Institute for Computer Applications in Science and Engineering, Hampton, VA USA
Modeling Reaction Control System Effects on Mars Odyssey ***Final Report***
Hanna, Jill L., Institute for Computer Applications in Science and Engineering, USA; Chavis, Zachary Q., George Washington Univ., USA; Wilmoth, Richard G., NASA Langley Research Center, USA; July 2002; 17p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAS1-97046; RTOP 505-90-52-01
Report No.(s): NASA/CR-2002-211767; NAS 1.26:211767; ICASE-2002-31; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the Mars 2001 Odyssey aerobraking mission, NASA Langley Research Center performed 6 degree of freedom (6-DOF) simulations to determine rotational motion of the spacecraft. The main objective of this study was to assess the reaction control system models and their effects on the atmospheric flight of Odyssey. Based on these models, a comparison was made between data derived from flight measurements to simulated rotational motion of the spacecraft during aerobraking at Mars. The differences between the simulation and flight derived Odyssey data were then used to adjust the aerodynamic parameters to achieve a better correlation.
Author
2001 Mars Odyssey; Aerobraking; Measuring Instruments; Mathematical Models; Mars Surface; Flight Simulation; Control Systems Design

65
STATISTICS AND PROBABILITY

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

20020074372 Naval Postgraduate School, Monterey, CA USA
The Role of Personality Type on Minority Attrition at the US Naval Academy
Burkins, Carl A.; Jun. 2002; 79p; In English; Original contains color images
Report No.(s): AD-A404702; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The attrition rate at the Naval Academy is higher for minority vs. not minority students. This thesis examines the predictors of minority attrition at the Naval Academy. Three categories of predictor variables were examined: gender, academic measures, and MBTI (Myers-Briggs Type Indicator) personality type. Specifically, the study focuses on the theories of college student attrition based on data from Historically Black Colleges and Universities, as well as traditional civilian universities. Data obtained from the Naval Academy's Institutional Research were analyzed. Results of the quantitative analysis show that the standardized test used in the admissions process (SAT) held little predictive value when examining minority attrition. A major finding drawn

from Chi Square analysis of the Myers-Briggs Personality Type Indicator revealed that several active personality types did better in terms of persistence at the Naval Academy. Recommendations addressed several areas of possible improvement and proposed further research regarding minority attrition.
DTIC
Minorities; Armed Forces (USA); Navy; Students; Personality; Performance Prediction

20020074888 Duke Univ., Durham, NC USA
Moving Target Depth Estimation for Passive Sonar, Using Sequential Resampling Techniques
Kraut, Shawn; Krolik, Jeffrey; Jan. 2000; 6p; In English
Contract(s)/Grant(s): N00014-01-1-0119
Report No.(s): AD-A405125; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We examine the problem of passive localization of a moving target in a littoral environment, based on its depth and range-rate. We compare performance with the conventional matched field processor which localizes in depth and range. Range-rate localization is more robust with respect to uncertainties in the environment, and with respect to associated uncertainties in the horizontal wave numbers of the channel modes used for the matched field target response. In our approach the complex amplitudes of the modes are treated as nuisance parameters, which comprise a hidden, first-order Markov state process. In lieu of an analytic expression for the evolution of the likelihood function as new snapshots are integrate, we evaluate a method of particle filtering, or sequential resampling.
DTIC
Targets; Sonar

20020076311 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden
Convergence of a Quantum Dynamic to a Classical Limit
Kolsrud, T.; Noble, J. M.; Zambrini, J. C.; Nov. 2000; 24p; In English
Report No.(s): PB2002-106269; TRITA-MAT-00-MA-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This article introduces, for the situation where the potential is time independent, a different diffusion with the probability measure associated to Schrodinger's equation. It is shown that, for the diffusion introduced here, the classical mechanics are recovered as the limit (in distribution) as H-0. Although this property is well established at a physical level, the arguments presented so far (eg Maslow's arguments, described in (2)) this is (to the knowledge of the authors) the first rigorous construction of a process with probability distributions associated to solutions of Schrodinger's equation which recovers the classical limit as h-0 and hence the first rigorous proof (in special situations) that classical dynamics is the h-0 limit of quantum dynamics. The diffusion process introduced in this article has thus already provided new information at a physical level.
NTIS
Convergence; Probability Theory; Quantum Mechanics; Schroedinger Equation; Mathematical Models; Classical Mechanics

66
SYSTEMS ANALYSIS AND OPERATIONS RESEARCH

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

20020074379 Naval Postgraduate School, Monterey, CA USA
Army Reserve Training Seat Allocation Model
Brown, Sylvester H.; Jun. 2002; 105p; In English; Original contains color images
Report No.(s): AD-A404770; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis reduces wasted Reserve training seats by one-fourth, improving resource use and increasing readiness. The Army Reserve currently uses approximately 80% of its scheduled Initial Entry Training seats each year (wasting over 3000 seats for soldiers assigned to Troop Program Units). Reasons include misalignment of Basic Combat Training with follow-on Advanced Individual Training scheduling too many seats during a period when targeted trainees are not available for training, and limited training capacity for specific specialties that units require for improved readiness. The Office of the Chief Army Reserve Personnel Division negotiates with other Army components in the Training Resource Arbitration panel to make adjustments to schedules of the Army Training Requirements and Resources System. Input from Recruiting Command and expert judgment is inadequate. This thesis allocates Army Reserve seats among competing needs of Army components and within available resources to increase seat utilization, thus increasing readiness. We validate the model by comparing historical training with model results and use these results to establish feasible training schedules to meet future goals and respond to readiness, recruiting and retention in the Army

Reserve. This model provides a Reserve training schedule for FY 03 that optimally allocates funded training resources to improve unit readiness, achieves fiscal year goals established by the Structure Manning Decision Review, and eliminates mismatches between basic and advanced training that caused lost training resources in the past. The Army Reserve can set various goals and establish a schedule that remains responsive to historical starts. When specialty readiness prioritization occurs, users will simply establish weights for these priorities as part of the input data.
DTIC
Optimization; Scheduling; Education

20020074786 Military Academy, Operations Research Center, West Point, NY USA
Hybrid Value-Utility Decision Analysis
Klimack, William K.; Jun. 2002; 76p; In English
Report No.(s): AD-A403768; DSE-TR-02-02; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Army faces complex decisions containing many variables and sources of uncertainty. Under standard DA (decision analysis) approaches, value functions are employed under conditions of certainty and utility functions under conditions of uncertainty. Utility functions are unique to an individual, and so must be elicited from the decision maker. The time of military decision makers is extremely valuable, and makes employment of the utility approach problematic. The concept of a hybrid value-utility DA model is promulgated. Such a model may be constructed beginning with a value model based on elicitations from subject matter experts, e.g., staff officers. Selected single dimensional value functions are replaced with the corresponding utility functions to form a hybrid model. Substitutions are prioritized through response surface methodology applied to the value functions of the decision model. Substitutions continue until the performance of the hybrid suitably estimates the performance of the true utility model. Construction of such a hybrid model minimizes the burden placed on the decision maker while maintaining the benefits of DA. A sample case illustrates the elicitation efficiency where an automatic target recognition classification system choice attribute set was reduced from 23 to 8.
DTIC
Decision Theory; Decision Making; Mathematical Models

20020074810 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Large-Scale Network Design Using Composite Variables: An Application to Air Mobility Command's 30-Day Channel Route Network
Nielsen, Christopher A.; Jun. 2002; 197p; In English; Original contains color images
Report No.(s): AD-A405002; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

Each month, the USA Air Force's Air Mobility Command is responsible for designing a large-scale air mobility network - called the channel route network that is used to transport military personnel and cargo throughout the world. Traditionally, planning the channel route network has been a manual process, requiring numerous hours to generate a monthly channel route schedule. We formulate the monthly channel route scheduling problem using traditional network design formulations, and we use Dantzig-Wolfe decomposition to overcome tractability issues. The resulting linear programming bounds on the optimal integer solution are weak, however. Furthermore, the formulation is unable to capture complex operational rules and regulations that govern aircraft flows and cargo flows through the channel route network. to overcome these challenges, we apply a variable redefinition technique known as composite variable modeling. Using this technique, we alleviate the need to explicitly include cargo flow decisions by implicitly capturing them in the design variables, which are then combined to create composite variables. A single composite variable represents the selection of one or more aircraft missions that completely cover a subset of cargo commodities. The resulting formulation is computationally superior to traditional network design formulations because it achieves tighter bounds - allowing excellent integer solutions to be found quickly - and it is able to capture complex operational rules and regulations. We illustrate that the nature of the formulation can be easily changed depending on the desired output by simply modifying the composite variable generation procedures, which does not compromise the structural properties of the formulation that allow it to achieve strong linear programming relaxations and short solution times.
DTIC
Linear Programming; Air Transportation; Logistics; Command and Control; Scheduling

20020076336 National Defence Research Establishment, Dept. of Command and Control Warfare Technology, Linkoeping, Sweden
Improving the Primal-Dual Algorithm for the Transportation Problem in the Plane
Kaijser, T.; Dec. 1999; 60p; In English
Report No.(s): PB2002-107055; FOA-R-99-01379-504-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The transportation problem in the plane-how to move a set of objects from one set of point to another set of points in the cheapest way-is a very old problem going back several hundreds of years. In recent years the solution of the problem has found applications in the analysis of digital images when searching for similarities and discrepancies between images. The main drawback, however, is the long computation time for finding the solution. In this paper we present some new results by which the time for solving the transportation problem in the plane can be reduced substantially. As cost-function we choose a distance-function between points in the plane. We consider both the case when the distance-function is equal to the ordinary Euclidean distance, as well as the case when the distance-function is equal to the ordinary Euclidean distance. This latter distance-function has the advantage that it is integer-valued if the coordinates of the points in the plane are integers.
NTIS
Networks; Analogies; Transportation; Euclidean Geometry; Algorithms

67
THEORETICAL MATHEMATICS

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

20020074265 NASA Ames Research Center, Moffett Field, CA USA
High-Order Semi-Discrete Central-Upwind Schemes for Multi-Dimensional Hamilton-Jacobi Equations
Bryson, Steve, NASA Ames Research Center, USA; Levy, Doron, Stanford Univ., USA; [2002]; 1p; In English; International Conference on Scientific Computing and Partial Differential Equations, 12-15 Dec. 2002, Hong Kong
Contract(s)/Grant(s): RTOP 704-40-42; No Copyright; Avail: Issuing Activity; Abstract Only

We present high-order semi-discrete central-upwind numerical schemes for approximating solutions of multi-dimensional Hamilton-Jacobi (HJ) equations. This scheme is based on the use of fifth-order central interpolants like those developed in [1], in fluxes presented in [3]. These interpolants use the weighted essentially nonoscillatory (WENO) approach to avoid spurious oscillations near singularities, and become ”central-upwind” in the semi-discrete limit. This scheme provides numerical approximations whose error is as much as an order of magnitude smaller than those in previous WENO-based fifth-order methods [2, 1]. Thee results are discussed via examples in one, two and three dimensions. We also pregnant explicit N-dimensional formulas for the fluxes, discuss their monotonicity and tl!e connection between this method and that in [2].
Author
Hamilton-Jacobi Equation; Upwind Schemes (Mathematics); Interpolation; Approximation; Singularity (Mathematics)

20020076407 ESDU International Ltd., London, UK
Compendium of curves and approximating algebraic functions
November 2001; In English; Available from ESDU International as part of the ESDU Series on Aircraft Performance.
Report No.(s): ESDU-01011; No Copyright; Avail: ESDU International, 27 Corsham Street, London, N1 6UA, UK; Abstract Only

ESDU (Engineering Sciences Data Unit) 01011 presents families of curve shapes and algebraic functions as an aid to the effective representation of experimental, numerical and graphical data by the selection of suitable such functions. The functions presented are divided into three categories: general multi-term functions, logic functions and single-term functions. No distinctions are made between the various applications of such algebraic functions, that is, representation of experimental results, representation of output from calculation procedures, or representation of pre-existing curves from graphical presentations of lines, ”carpets” and ”lattices”. A separate ESDU document will give examples and guidance on the use of different classes of function for particular purposes.
ESDU
Functions (Mathematics); Graphs (Charts); Representations; Numerical Analysis

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.

20020074384 Defence Science and Technology Organisation, Victoria, Australia
Effect of Broad-banding Amplifiers on E-field Probe Measurements in a Reverberant Cavity
Priest, Timothy S.; Sep. 2001; 24p; In English
Report No.(s): AD-A404844; DSTO-RR-0227; DODA-AR-012-100; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Broad-band electric-field probes have gained wide-spread acceptance for use in reverberation chambers in recent years, primarily due to their ease of use. However, recent work with AOD has highlighted situations where E-field probes may return ambiguous results. In particular, the SR may be greatly affected by the wide-band frequency reception of an E-field probe when in the presence of multiple frequencies in a reverberant environment Monte Carlo simulations conducted to examine the effects of multiple frequencies on probe measurements in a reverberant cavity were compared with experimental data that was taken by an E-field probe that was in the presence of an amplifier exhibiting distortion in a reverberation chamber. The experimental results indicate that considerable care should be taken to ensure frequency purity in a reverberant environment when making E-field probe measurements.
DTIC
Electric Fields; Broadband; Environment Simulation; Distortion

20020074845 Virginia Polytechnic Inst. and State Univ., Bradley Dept. of Electrical and Computer Engineering, Blacksburg, VA USA
Scattering from Rough Surfaces With a Vegetated Cover ***Final Report, Jun. 1996-Jun. 1999***
Davis, B. A.; Adams, R. J.; Brown, G. S.; Aug. 25, 1999; 118p; In English
Contract(s)/Grant(s): F19628-96-C-0072; Proj-4600
Report No.(s): AD-A404969; AFRL-SN-HS-TR-2002-012; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report summarizes the research to date on describing the incoherent pulse response of a foliage layer on top of a rough surface under conditions of a relatively narrowband, narrow beamwidth illumination. The incoherent impulse response for the foliage is developed in terms of a multi-convolutional description of the incoherent scattering process. The surface scattering is described by the MOMI-based numerical method. The interaction between a cylinder located above a rough surface is used to determine the separation distance for which the interaction between the foliage scattered fields and the rough surface may be ignored. The resulting model is designed to be matched to foliage scattering data in order to 'calibrate' the model scattering parameters.
DTIC
Surface Roughness; Wave Propagation; Incoherent Scattering; Foliage

20020074996 Applied Computational Electromagnetics Society, USA
Applied Computational Electromagnetics Society Journal. Volume 17, Number 2
Elsherbeni, Atef Z.; Jul. 2002; 76p; In English; ISSN 1054-4887 For individual articles, see ADP012578 thru ADP012584
Report No.(s): AD-A405013; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Applied Computational Electromagnetics Society (ACES) Journal, hereinafter known as the ACES Journal, is devoted to the exchange of information in computational electromagnetics, to the advancement of the state-of-the art, and the promotion of related technical activities. A primary objective of the information exchange is the elimination of the need to 'reinvent the wheel' to solve a previously-solved computational problem in electrical engineering, physics, or related fields of study. The technical activities promoted by this publication include code validation, performance analysis, and input/output standardization; code or technique optimization and error minimization; innovations in solution technique or in data input/output; identification of new applications for electromagnetics modeling codes and techniques; integration of computational electromagnetics techniques with new computer architectures; and correlation of computational parameters with physical mechanisms.
DTIC
Periodicals; Electromagnetism; Computation

20020075575 Glick, (R. L.), Rensselaer, IN USA

On Acceleration Effects

Glick, R. L., Glick, (R. L.), USA; Hessler, R. O., Hessler (R. O.), USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 333-344; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Quasi-steady acceleration effects became a significant problem when AL retention and ballistic effects problems appeared in rocket propelled flight vehicles spun to achieve attitude stabilization. Acceleration effects (AL retention in a circumferential slot) can be painfully obvious. Motor level effects are easily observed with conventional instrumentation and vary with the acceleration environment (static, static spin, and flight). Illustrates general acceleration augmentation characteristics - burning rates that are pressure, acceleration magnitude and direction (with respect to the outward surface normal) dependent.

Derived from text

Acceleration (Physics); Attitude Control; Attitude Stability

20020075736 Helsinki Univ. of Technology, Metrology Research Inst., Espoo Finland

Helsinki University of Technology Department of Electrical and Communications Engineering, Metrology Research Institute Report ***Annual Report, 2000***

Kaerhae, P.; 2001; In English

Report No.(s): PB2002-107021; Copyright; Avail: National Technical Information Service (NTIS), CD-ROM

The research activities in the Metrology Research Institute cover a broad range from microsystems to fibre optics or from quantum optics to applied metrology. Year 2000 was very successful for the Institute and the number of personnel increased rapidly. Two major scientific positions were established in the Institute: Hanne Ludvigsen received the position of the Academy Research Fellow in August 2000 and Ilkka Tittonen was appointed as Professor in December 2000. An exceptionally large number of international comparison measurements, altogether eleven, were carried out last year by the Metrology Research Institute. One of the main research efforts of the Institute during the recent years has been development of characterized filter radiometers for absolute measurement of optical radiation quantities. The Metrology Research Institute is an active participant within EU Research Programmes. We coordinate the Thematic Network for Ultraviolet Measurements with about fifty participants from all over the Europe.

NTIS

Electrical Engineering; Metrology; Optical Properties; Quantum Optics; Research and Development

20020075974 Argonne National Lab., IL USA

Versatile DC/pulse switching mode power supply for an interleaving dipole magnet.

Wang, J.; Fors, T.; Sprau, G.; Jun. 04, 2002; 3p; In English

Report No.(s): DE2001-795821; ANL/ASD/CP-106673; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A special interleaving operation of the Advanced Photon Source's injector requires three dipole magnets to selectively direct linac beam bunches into the storage ring during 'top-up' operation. A versatile switching mode power supply has been designed and built for the magnets to meet that requirement. This paper presents the main circuit, the circuit analysis, and the test results.

NTIS

Magnets; Photons; Storage Rings (Particle Accelerators); Electric Networks; Network Analysis; Magnetic Dipoles

20020076001 Fermi National Accelerator Lab., Batavia, IL USA

Pulsed magnetic field measurement using a ferrite waveguide in a phase bridge circuit

Pellico, W. A.; Colestock, P.; Jul. 01, 2002; 3p; In English

Report No.(s): DE2001-795918; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

There are several standard methods used for measuring pulsed magnetic fields. However the induction or Hall probe methods have limited bandwidth and experience reflection problems. The integrated magnetic field can only be found by measuring along the entire length of the magnet. Problems with reflections, noise and bandwidth will limit the accuracy of measurement. Presented in the following paper is a method for measuring pulsed fields without the typical noise errors and bandwidth limitations. This paper will describe a phase bridge network that relies upon the permeability of a ferrite waveguide to accurately measure the integrated field of a Main Injector kicker magnet. The authors present some data taken with the system, a first pass at the analysis of this data, and discuss some possible design variations.

NTIS

Magnetic Fields; Permeability; Injectors; Ferrites

20020076039 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

In-Situ Calibration: Migrating Control System IP Module Calibration from the Bench to the Storage Ring

Weber, J. W.; Chin, M.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-796102; No Copyright; Avail: National Technical Information Service (NTIS)

Control System for the Advanced Light Source (ALS) at Lawrence Berkeley National Lab (LBNL) uses in-house designed IndustryPack (registered trademark) (IP) modules contained in compact PCI (cPCI) crates with 16-bit analog I/O to control instrumentation. to make the IP modules interchangeable, each module is calibrated for gain and offset compensation. We initially developed a method of verifying and calibrating the IP modules in a lab bench test environment using a PC with LabVIEW. The subsequent discovery that the ADCs have significant drift characteristics over periods of days of installed operation prompted development of an 'in-situ' calibration process--one in which the IP modules can be calibrated without removing them from the cPCI crates in the storage ring. This paper discusses the original LabVIEW PC calibration and the migration to the proposed in-situ EPICS control system calibration.

NTIS

Calibrating; Control

20020076171 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Time reversal invariance - a test in free neutron decay

Lising, L. J.; May 18, 1999; 180p

Report No.(s): DE2001-760390; LBNL--43439; No Copyright; Avail: Department of Energy Information Bridge

Time reversal invariance violation plays only a small role in the Standard Model, and the existence of a T-violating effect above the predicted level would be an indication of new physics. A sensitive probe of this symmetry in the weak interaction is the measurement of the T-violating 'D'-correlation in the decay of free neutrons. The triple-correlation D(sigma)(sub n)(center dot)p(sub e) x p(sub v) involves three kinematic variables, the neutron spin, electron momentu, and neutrino (or proton) momentum, and changes sign under time reversal. This experiment detects the decay products of a polarized cold neutron beam with an octagonal array of scintillation and solid-state detectors. Data from first run at NIST's Cold Neutron Research Facility give a D-coefficient of -0.1 (+-) 1.3(stat.) (+-) 0.7(syst) x 10(sup -3). This measurement has the greatest bearing on extensions to the Standard model that incorporate leptoquarks, although exotic fermion and lift-right symmetric models also allow a D as large as the present limit.

NTIS

Neutron Decay; Invariance; Kinematics; Standard Model (Particle Physics); Cold Neutrons; Solid State Physics

20020076181 Fermi National Accelerator Lab., Batavia, IL USA

Production and test of the first LQXB inner triplet quadrupole at Fermilab

Bossert, R.; Jun. 26, 2002; 3p; In English

Report No.(s): DE2001-795648; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Fermilab, in collaboration with LBNL and BNL, has developed a quadrupole (MQXB) for installation in the interaction region inner triplets of the LHC. This magnet is required to have an operating gradient of 215 T/m across a 70 mm coil bore, and to operate in superfluid helium at 1.9K. Two 5.5 m long MQXB magnets are combined with a dipole orbit corrector to form a single cryogenic unit (LQXB). This paper discusses the construction and test of the first full-scale production-quality LQXB.

NTIS

Cryogenics; Quadrupoles; Superfluidity; Atomic Energy Levels

20020076182 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

SM01a and SM01b test results

Coccoli, M.; Chiesa, L.; Feb. 18, 2002; 16p; In English

Report No.(s): DE2001-796099; LBNL--50145; SC-MAG 775; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

No abstract prepared.

NTIS

Magnets; High Energy Interactions

20020076221 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Coldmass for lhc dipole insertion magnets.
Gupta, A.; Alforque,; Anerella,; Kelly,; Plate,; Oct. 20, 1997; 4p; In English
Report No.(s): DE2001-797112; BNL--69157; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Brookhaven National Laboratory (BNL) is building a number of magnets for the insertion regions of the Large Hadron Collider (LHC). This paper presents the magnetic design and the expected field quality in 2-in-1 dipole magnets. A unique feature of this coldmass design is the use of an oblate-shaped yoke. This concept permits a variety of BNL-built magnets to have a similar overall design and allows the LHC main dipole cryostat, post, etc., to be used in these magnets. The proposed oblate-shaped yoke also offers a way to reduce the overall cryostat size in future magnets. The dipoles will use the same 80 mm aperture coils as used in the Relativistic Heavy Ion Collider (RHIC) dipole magnets, but will use stainless steel collars. The design presented here is still evolving and the magnets may be built differently than described here.
NTIS
Dipoles; Magnets; Apertures; Yokes

20020076224 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Metallization of sns ring injection kicker ceramic chambers.
He,; Hseuh, C.; Todd, J.; Jun. 03, 2002; 3p; In English
Report No.(s): DE2001-797131; BNL--68921; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Ceramic chambers will be used in the pulsed kicker magnets for the injection of H(sup -) into the Spallation Neutron Source (SNS) accumulator ring, to avoid shielding of a fast-changing external magnetic field by metallic chamber walls and to reduce eddy current heating. The inner surfaces of the ceramic chambers will be coated with a conductive layer, possibly titanium (Ti) or copper (Cu) with a titanium nitride (TiN) overlayer, to reduce the beam coupling impedance, provide passage for beam image current and to reduce the secondary electron yields. This paper describes the development of sputtering method for the 0.83m long 16cm inner diameter (ID) ceramic chambers. Coatings of Ti, Cu and TiN with thickness up to 10 (micro)m were produced by means of DC magnetron sputtering. The difficulty of coating insulators was overcome with the introduction of an anode screen. Films with good adhesion, uniform longitudinal thickness, and conductivity were produced.
NTIS
Accelerators; Ceramics; Accumulators; Magnetron Sputtering; Magnets

20020076429 Princeton Univ., Plasma Physics Lab., NJ USA
Status of the Experimental Physics and Industrial Control System at NSTX
Sichta, P.; Dong, J.; Jan. 28, 2002; 7p; In English
Report No.(s): DE2001-795710; PPPL-3656; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The NSTX (National Spherical Torus Experiment) achieved first plasma in 1999. The Experimental Physics and Industrial Control System (EPICS) is used to provide data-integration services for monitoring and control of all NSTX engineering subsystems. EPICS is a set of software initially developed at U.S. DOE laboratories. It is currently used and maintained through a global collaboration of hundreds of scientists and engineers. This paper will relate some of our experiences using and supporting the EPICS software. Topics include reliability and maintainability, lessons learned, recently added engineering subsystems, new EPICS software tools, and a review of our first EPICS software upgrade. Steps to modernize the technical infrastructure of EPICS to ensure effective support for NSTX will also be described.
NTIS
Control; Plasmas (Physics); Computer Programs

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ACOUSTICS

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

20020074375 Naval Postgraduate School, Monterey, CA USA
The Effect of Sound Spatialization on Responses to Overlapping Messages
Campbell, James R.; Jun. 2002; 137p; In English; Original contains color images
Report No.(s): AD-A404765; No Copyright; Avail: CASI; A07, Hardcopy

The purpose of this research was to determine if a spatialized headphone display would improve users' recognition accuracy when listening to more than two overlapping messages. This type of task has numerous applications in a variety of different military settings, such as aviation communications and combat information centers. Two experiments were conducted in the Advanced Auditory Displays Laboratory at the Naval Postgraduate School. The first experiment was a pilot study which was designed to identify the factors that contributed to changes in response accuracy rates. The conclusion of this effort was a decision to use a chi-squared analysis and a multivariate logit regression, which could examine the influence of several factors in addition to spatialization. Results indicated that participants accurately identified 43 percent of the messages in the spatialized condition, but only 17 percent of the messages in the non-spatialized condition. Chi-squared tests indicated a dependent relationship between accuracy and spatialization under a variety of conditions. The logit regression model confirmed these conclusions and indicated that the chance of a completely correct response was improved by approximately 30 percent with the use of spatialization.
DTIC
Speech Recognition; Message Processing; Earphones

20020074376 Naval Postgraduate School, Monterey, CA USA
Link Budget Analysis for Undersea Acoustic Signaling
Hansen, Joseph T.; Jun. 2002; 59p; In English; Original contains color images
Report No.(s): AD-A404761; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Link-budget analysis is commonly applied to satellite and wireless communications for estimating signal-to-noise ratio (SNR) at the receiver. Link-budget analysis considers transmitter power, transmitter antenna gain, channel losses, channel noise, and receiver antenna gain. For underwater signaling, the terms of the sonar equation readily translate to a formulation of the link budget. However, the strong frequency dependence of underwater acoustic propagation requires special consideration, and is represented as an intermediate result called the channel SNR. The channel SNR includes ambient-noise and transmission-loss components. Several acoustic communication and navigation problems are addressed through wideband link-budget analyses.
DTIC
Signal to Noise Ratios; Underwater Communication; Signal Analysis; Signal Processing

20020074773 Naval Postgraduate School, Monterey, CA USA
Detection of Binary Phase-Shift Keying Signal in Multipath Propagation
Jung, Du S.; Jun. 2002; 105p; In English; Original contains color images
Report No.(s): AD-A404954; No Copyright; Avail: CASI; A06, Hardcopy

Time-varying dispersion and multipath propagation in a shallow underwater environment causes intersymbol interference in underwater communication. This thesis investigates a mitigation procedure for communication using a Binary Phase-Shift Keying (BPSK) signal. The method employed uses the time-reversed ocean impulse response to mitigate the degradation of the bit error rate performance. All results were achieved by the use of computer simulation of typical shallow water environments.
DTIC
Underwater Acoustics; Multipath Transmission

20020074829 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA
Adaptive Beamforming for Submarine-Satellite Communications with the (MBCA) Multielement Buoyant Cable Array Antenna
Carlson, Blair D.; Jan. 2001; 3p; In English
Report No.(s): AD-A404878; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In order to provide the capability for submarines to communicate through a satellite while remaining submerged and traveling at operational speeds a towed buoyant cable array antenna is being developed. The array is adaptive from the point of view that the direction of the satellite need not be known, the position and orientation of the array need not be know, and the shape of the flexible array need not be known. A blind equalization procedure is used to estimate the signal space from the downlink signal and create a spatial matched filter for receive. While the frequency division satellite system is intended to allow only one signal per frequency slot, the system can also operate in the presence of jamming by separating multiple sources spatially. Once the downlink receive antenna weights have been obtained, the more difficult task of obtaining uplink weights at a separated frequency must be performed. Since no data is available for blind equalization at the transmit frequency a frequency extrapolation method is used to extend the downlink receive weights to frequencies beyond where the equalization data was collected. This extrapolation

is complicated by 2-pi ambiguities of the measured phases as well as amplification of measurement errors in the extrapolation process. An algorithm has been developed that performs well.
DTIC
Countermeasures; Radar Equipment; Antenna Arrays; Beamforming; Adaptive Control

20020075003 North Carolina State Univ., Dept. of Mathematics, Raleigh, NC USA
Active Shielding and Control of Environmental Noise ***Final Report, 1 Jul. - 31 Dec. 2001***
Tsynkov, S. V., North Carolina State Univ., USA; [2001]; 2p; In English
Contract(s)/Grant(s): NAG1-01064; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In the framework of the research project supported by NASA under grant # NAG-1-01064, we have studied the mathematical aspects of the problem of active control of sound, i.e., time-harmonic acoustic disturbances. The foundations of the methodology are described in our paper [1]. Unlike. many other existing techniques, the approach of [1] provides for the exact volumetric cancellation of the unwanted noise on a given predetermined region airspace, while leaving unaltered those components of the total acoustic field that are deemed as friendly. The key finding of the work is that for eliminating the unwanted component of the acoustic field in a given area, one needs to know relatively little; in particular, neither the locations nor structure nor strength of the exterior noise sources need to be known. Likewise, there is no need to know the volumetric properties of the supporting medium across which the acoustic signals propagate, except, maybe, in a narrow area of space near the perimeter of the protected region. The controls are built based solely on the measurements performed on the perimeter of the domain to be shielded; moreover, the controls themselves (i.e., additional sources) are concentrated also only on or near this perimeter. Perhaps as important, the measured quantities can refer to the total acoustic field rather than to its unwanted component only, and the methodology can automatically distinguish between the two. In [1], we have constructed the general solution for controls. The apparatus used for deriving this general solution is closely connected to the concepts of generalized potentials and boundary projections of Calderon's type. For a given total wave field, the application of a Calderon's projection allows one to definitively tell between its incoming and outgoing components with respect to a particular domain of interest, which may have arbitrary shape. Then, the controls are designed so that they suppress the incoming component for the domain to be shielded or alternatively, the outgoing component for the domain, which is complementary to the one to be shielded.
Derived from text
Active Control; Noise (Sound); Sound Waves; Shielding

20020076083 Technische Univ., Faculty of Civil Engineering and Geosciences, Delft, Netherlands
Dynamic Calibration of Multibeam Systems
Dunnewold, J. J.; Nov. 1998; 100p; In English
Report No.(s): PB2002-105912; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

Multibeam echosounding is a relatively new acoustic technique to obtain the relative or absolute position of points underwater. The system uses the measured two-way-travel-time of the acoustic signal to calculate the coordinates of the point on the sea bottom from which the signal returns. In contrast to already longer existing singlebeam echosounders multiple beams are submitted at once using a fan-shaped beam-pattern. During the last few years the accuracy and error-propagation of this system has been investigated thoroughly, but little has been done with the validation of the system. One way of validating the system is to do extensive calibrations in advance of a measurement campaign. Existing calibration methods can be subdivided into a dynamic and static part. In this thesis the dynamic calibration procedures have been studied. The present calibration methods do have a few important disadvantages, which may be the reason to develop a new approach of calibration. The result of a better calibrated multibeam device would be better or more valid end results.
NTIS
Sonar; Calibrating

20020076319 National Defence Research Establishment, Avd. foer Vapen och Skydd, Tumba, Sweden
Hull Induced Noise: Part 1: Hydrodynamic Noise Produced by the Turbulent Flow around a Rigid Hull
Fureby, C.; Almstroem, H.; Jun. 20, 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-105051; FOI-R-0130-SE; No Copyright; Avail: National Technical Information Service (NTIS)

The present study is a contribution towards a better understanding of the fundamental physics on hydrodynamic noise produced by the turbulent flow around a rigid hull. The approach taken here is that the incompressible flow field is evaluated using Large Eddy Simulation (LES). In the second step, equations for the acoustic variables are solved and the source terms for the wave

equation for the acoustic pressure field are obtained. We have applied this calculation procedure to the flow around a prolate spheroid in order to demonstrate the method.
NTIS
Hulls (Structures); Hydrodynamics; Underwater Vehicles; Noise (Sound)

20020076335 National Defence Research Establishment, Div. of Systems and Underwater Technology, Stockholm, Sweden
Optimal Information Transmission in the Auditory System
Karlsson, M.; Dec. 1999; 66p; In English
Report No.(s): PB2002-107056; FOA-R-99-01378-409; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The work is an investigation of the information processing performed in the first part of the neural auditory system. The basic tool used is a general class of performance criteria from statistics (the f-divergences) that have close relations to various fundamental bounds in information theory. In contrast to the often used signal-to-noise ratios (SNR), the f-divergences have a well defined meaning for almost any kind of stochastic dynamical system, in particular nonlinear ones for which SNR can be misleading. Using maximization of f-divergences as performance criteria, optimum system behavior is defined and analyzed with respect to parameter and structural variations. In the numerical simulations it is found that, under the given assumptions, it is possible to define an optimal first part of the processing chain which makes it easier for the brain to detect a weak incoming signal in noise. The results also show that this optimal first part can be designed in several ways, but common to all suitable models is an intimate connection with spontaneous spiking rate from the first neuron in the chain. This can therefore serve as a partial explanation of the up to now not completely account for rate of activity in an unstimulated auditory nerve.
NTIS
Auditory Signals; Signal Processing; Auditory Sensation Areas; Signal to Noise Ratios; Stochastic Processes; Data Processing; Data Transmission

20020076362 Swedish Defence Research Establishment, Aeronautics Div., Stockholm Sweden
Numerical Study of Acoustic Waves in a Non-Homogeneous Flow
Hetyei, A.; Efraimsson, G.; Nov. 2001; 50p
Report No.(s): PB2002-106223; FOI-R-0243-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A numerical study of acoustic waves propagating in a non homogenous flow was performed on a two dimensional domain. A subsonic jet flow was used as a base flow to which an acoustic wave was superimposed. It was theoretically and numerically verified that the jet flow model that was used satisfied the Euler equations. In the numerical verification instabilities appeared the pressure and velocity fields. Since the instabilities were reflected at the outflow boundary and hence would destroy the calculations including acoustic waves, attempts were made to reduce the magnitude of the instabilities before they reached the outflow boundary. Examination of how many grid points that had to be used in order to propagate the acoustic wave in a non-homogenous medium was made.
NTIS
Numerical Analysis; Inhomogeneity; Jet Flow; Sound Waves; Two Dimensional Flow

20020077964 NASA Marshall Space Flight Center, Huntsville, AL USA
Hearing Aid Assembly
Grugel, Richard N., Inventor, NASA Marshall Space Flight Center, USA; Sep. 03, 2002; 6p; In English
Patent Info.: Filed 6 Aug. 2001; NASA-Case-MFS-31560-1; US-Patent-6,445,805; US-Patent-Appl-SN-923261; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Progress in hearing aids has come a long way. Yet despite such progress hearing aids are not the perfect answer to many hearing problems. Some adult ears cannot accommodate tightly fitting hearing aids. Mouth movements such as chewing, talking, and athletic or other active endeavors also lead to loosely fitting ear molds. It is well accepted that loosely fitting hearing aids are the cause of feedback noise. Since feedback noise is the most common complaint of hearing aid wearers it has been the subject of various patents. Herein a hearing aid assembly is provided eliminating feedback noise. The assembly includes the combination of a hearing aid with a headset developed to constrict feedback noise.
Official Gazette of the U.S. Patent and Trademark Office
Hearing; Noise (Sound); Audiology; Mechanical Devices

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ATOMIC AND MOLECULAR PHYSICS

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

20020074596 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Quantum Computation by Optically Coupled Steady Atoms/Quantum-Dots Inside a Quantum Cavity
Pradhan, P., California Univ., USA; Wang, K. L., California Univ., USA; Roychowdhury, V. P., California Univ., USA; Anantram, M. P., MRJ Technology Solutions, Inc., USA; Mor, T., MRJ Technology Solutions, Inc., USA; [1999]; 1p; In English; American Physical Society Meeting, 20-26 Mar. 1999, Atlanta, GA, USA; Sponsored by American Physical Society, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

We present a model for quantum computation using n steady 3-level atoms kept inside a quantum cavity, or using n quantum-dots (QDs) kept inside a quantum cavity. In this model one external laser is pointed towards all the atoms/QDs, and n pairs of electrodes are addressing the atoms/QDs, so that each atom is addressed by one pair. The energy levels of each atom/QD are controlled by an external Stark field given to the atom/QD by its external pair of electrodes. Transition between two energy levels of an individual atom/ QD are controlled by the voltage on its electrodes, and by the external laser. Interactions between two atoms/ QDs are performed with the additional help of the cavity mode (using on-resonance condition). Laser frequency, cavity frequency, and energy levels are far off-resonance most of the time, and they are brought to the resonance (using the Stark effect) only at the time of operations. Steps for a controlled-NOT gate between any two atoms/QDs have been described for this model. Our model demands some challenging technological efforts, such as manufacturing single-electron QDs inside a cavity. However, it promises big advantages over other existing models which are currently implemented, and might enable a much easier scale-up, to compute with many more qubits.
Author
Quantum Computation; Mathematical Models; Laser Outputs; Energy Levels; Cavities

20020074602 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Substrate Effects on Electronic Properties of Atomic Chains
Yamada, Toshishige, MRJ Technology Solutions, Inc., USA; [1998]; 1p; In English; 45th American Vacuum Society Meeting (AVS), 2-6 Nov. 1998, Baltimore, MD, USA; Sponsored by American Vacuum Society, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

Atomic chains, precise structures of adatoms created on an atomically regulated surface, are candidates for constituent elements in future electronics. It was predicted that Si chains were metallic and Mg chains were semiconducting, and a doping method was also discussed. The substrate was assumed to work as a non-interacting template holding the adatoms. However, this scheme requires a low-temperature environment so that the adatoms will not displace from their ideal positions due to unwanted thermal agitation. For better structural stability, we may seek a scheme to allow the adatoms to form chemical bonding with the substrate atoms and secure their positions. The chemical bonding has two major effects on the chain electronic properties. First, only the remaining s and p orbitals in an adatom not used for the chemical bonding can decide chain band structures, rather than the full set of orbitals previously assumed. Second, because of a possible HOMO energy difference between adatom and substrate atom, semiconducting chains are unintentionally doped. These effects are studied with a self-consistent tight-binding method with universal parameters. With one adatom per unit cell, adatom chains are semiconducting: (1) if adatoms are of group III and form one chemical bond per adatom, or (2) if adatoms are of group IV and form two chemical bonds. 'Me previous result [I I of realizing semiconducting chains by group II adatoms without chemical bonds is consistent with this picture. When the HOMO energy in an adatom is shallower than that in a substrate atom, the entire chain is positively polarized, unintentionally achieving p-type doping. When deeper, the chain is negatively charged, achieving n-type doping.
Author
Atomic Structure; Electrical Properties; Substrates; Structural Stability; Chemical Bonds; Chains

20020074609 NASA Ames Research Center, Moffett Field, CA USA
The Scalar Relativistic Contribution to Ga-Halide Bond Energies
Bauschlicher, Charles W., Jr., NASA Ames Research Center, USA; [1998]; 1p; In English
Contract(s)/Grant(s): RTOP 242-80-01; No Copyright; Avail: Issuing Activity; Abstract Only

The one-electron Douglas Kroll (DK) and perturbation theory (+R) approaches are used to compute the scalar relativistic contribution to the atomization energies of GaFn. These results are compared with the previous GaCln results. While the +R and DK results agree well for the GaCln atom nation energies, they differ for GaFn. The present work suggests that the DK approach

is more accurate than the +R approach. In addition, the DK approach is less sensitive to the choice of basis set. The computed atomization energies of GaF2 and GaF3 are smaller than the somewhat uncertain experiments. It is suggested that additional calibration calculations for the scalar relativistic effects in GaF2 and GaF3 would be valuable.
Author
Halides; Gallium Compounds; Atomizing; Perturbation Theory; Relativistic Effects

20020074984 Colorado Univ., Boulder, CO USA
Photoelectron Spectroscopy and Dynamics of Adsorbates on Clusters ***Final Report, 1 Apr. 1999-28 Feb. 2002***
Lineberger, Wiiliam C.; Jun. 30, 2002; 7p; In English
Contract(s)/Grant(s): F49620-99-1-0201; Proj. 2303
Report No.(s): AD-A404861; AFRL-SR-AR-TR-02-0242; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A simple sputter source of thermal silicon carbide cluster anions has been developed and tested. Vibrationally resolved photoelectron spectra have been obtained for a number of anions of the form Si(sub n)C(sub m(-)), with n + m less than -8. Full interpretation of the spectra requires accurate calculation of the anion structure, carried out in collaboration with Gordon (ISU) and Burggraf (AFIT). The first fully analyzed spectra and calculations for asymmetric species (n less than m) are complete; two three manuscripts describe this work. A laser ablation ion source has been designed to produce the important (but difficult to produce) n = m Si(sub n)C(sub m(-)) ions. Other new work systematically investigates the complex electronic structure of the nickel column metal oxides.
DTIC
Spectroscopy; Anions; Photoelectron Spectroscopy; Adsorption; Metal Clusters; Electronic Structure

20020076174 Three-D-Computing, Inc., DeSoto, TX USA
Fast particles identification in programmable form at level-0 trigger by means of the 3D-Flow system
Crosetto, D. B.; Oct. 30, 1998; 9p
Report No.(s): DE2001-762191; CERN/LHCC/98-36; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The 3D-Flow Processor system is a new, technology-independent concept in very fast, real-time system architectures. Based on either an FPGA or an ASIC implementation, it can address, in a fully programmable manner, applications where commercially available processors would fail because of throughput requirements. Possible applications include filtering-algorithms (pattern recognition) from the input of multiple sensors, as well as moving any input validated by these filtering-algorithms to a single output channel. Both operations can easily be implemented on a 3D-Flow system to achieve a real-time processing system with a very short lag time. This system can be built either with off-the-shelf FPGAs or, for higher data rates, with CMOS chips containing 4 to 16 processors each. The basic building block of the system, a 3D-Flow processor, has been successfully designed in VHDL code written in 'Generic HDL' (mostly made of reusable blocks that are synthesizable in different technologies, or FPGAs), to produce a netlist for a four-processor ASIC featuring 0.35 micron CBA (Ceil Base Array) technology at 3.3 Volts, 884 mW power dissipation at 60 MHz and 63.75 mm sq. die size. The same VHDL code has been targeted to three FPGA manufacturers (Altera EPF10K250A, ORCA-Lucent Technologies 0R3T165 and Xilinx XCV1000). A complete set of software tools, the 3D-Flow System Manager, equally applicable to ASIC or FPGA implementations, has been produced to provide full system simulation, application development, real-time monitoring, and run-time fault recovery. Today's technology can accommodate 16 processors per chip in a medium size die, at a cost per processor of less than $5 based on the current silicon die/size technology cost.
NTIS
Algorithms; Three Dimensional Flow; Pattern Recognition; Architecture (Computers); Systems Engineering

20020076261 Los Alamos National Lab., NM USA
The Future of Computational Materials Science: The Role of Atomistics
Baskes, Michael I., Los Alamos National Lab., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 65-92; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This talk will start with a tutorial on computational methods and techniques. Two examples of atomistic calculations will be presented: mechanical properties and phase transformations. The author's view of the future of computational materials science will be presented. The concept of entity is introduced. Each entity is connected to a specific method that may be used for

calculations involving that entity. This talk with concentrate on semiempirical methods. These methods have a basis in physics or chemistry, but use experimental data.
Author
Materials Science; Computerized Simulation

20020076262 Minnesota Mining and Mfg. Co., Materials Modeling, Advanced Materials Tech Center, Saint Paul, MN USA
Materials Modeling and Simulation as a Technology Platform for Advanced Materials Development
Caldwell, Gregg, Minnesota Mining and Mfg. Co., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 93-123; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The AMTC has significant expertise in modeling material behavior. The group is focused on the prediction of performance by using an integrated approach for various length and times scales - atomistic, molecular, polymer, mesoscale, fluid transport (including microfluidics), through applied mechanics. The goal is to accelerate materials development with modeling and simulation and help develop new products and processes through computational methods. The modeling group within the AMTC uses a hierarchical approach to materials modeling. The challenge of bridging the gaps in size and time scales is recognized with a 'bottom up' and 'top down' approach used to link well understood design and constitutive modeling approaches with first principles approaches.
Derived from text
Mathematical Models; Computerized Simulation; Molecular Structure; Solubility; Self Assembly

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.

20020075677 Argonne National Lab., IL USA
Comparison of equilibrium and non-equilibrium cycle methods for Na-cooled ATW system.
Kim, Y.; Hill, R. N.; Taiwo, T. A.; Mar. 30, 2002; 4p; In English
Report No.(s): DE2001-795824; ANL/RAE/CP-107170; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An equilibrium cycle method, embodied in the REBUS-3(1) code system, has generally been used in conventional fast reactor design activities. The equilibrium cycle method provides an efficient approach for modeling reactor system, compared to the more traditional non-equilibrium cycle fuel management calculation approach. Recently, the equilibrium analysis method has been utilized for designing Accelerator Transmutation of Waste (ATW)(2,3,4) cores, in which a scattered-reloading fuel management scheme is used. Compared with the conventional fast reactors, the ATW core is significantly different in several aspects since its main mission is to incinerate the transuranic (TRU) fuels. The high burnup non-fertile fuel has large variations in composition and reactivity during its lifetime. Furthermore, a relatively short cycle length is utilized in the ATW design to limit the potentially large reactivity swing over a cycle, and consequently 7 or 8-batch fuel management is usually assumed for a high fuel burnup. The validity of the equilibrium analysis method for the ATW core, therefore, needed to be verified. The main objective of this paper is to assess the validity of the equilibrium analysis method for a Na-cooled ATW core(4), which is an alternative core design of the ATW system under development.
NTIS
Accelerators; Fast Nuclear Reactors; Fuels; Reactivity; Reactor Design

20020076007 Argonne National Lab., Physics Div., IL USA
Post-Accelerator for the US Rare Isotope Accelerator Facility
Ostroumov, P. N.; Kelly, M. P.; Kolomiets, A. A.; Nolen, J. A.; Portillo, M.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-43155; No Copyright; Avail: National Technical Information Service (NTIS)

The proposed Rare Isotope Accelerator (RIA) Facility includes a post-accelerator for rare isotopes (RIB linac) which must produce high-quality beams of radioactive ions over the full mass range, including uranium, at energies above the coulomb barrier, and have high transmission and efficiency. The latter requires the RIB linac to accept at injection ions in the 1+ charge state. A

concept for such a post accelerator suitable for ions up to mass 132 has been previously described. This paper presents a modified concept which extends the mass range to uranium. A high resolution separator for purifying beams at the isobaric level precedes the RIB linac. The mass filtering process will provide high purity beams while preserving transmission.
NTIS
Ion Accelerators; Radioactive Isotopes; Ion Beams

20020076011 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Electron Cloud in Linear Collider Damping Rings
Wolski, A.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-796104; No Copyright; Avail: National Technical Information Service (NTIS)
The positron damping rings for a future linear collider will operate at energies and with beam currents where electron cloud effects could be a significant problem. Both coupled-bunch and single-bunch instabilities would adversely affect damping ring performance, by limiting the stored current, or by increasing the transverse bunch size; either effect would reduce the luminosity of the collider. Recent work has estimated, for TESLA (Tera Electron Volt Energy Superconducting Linear Accelerator) and the NLC (Next Linear Collider), the thresholds and growth rates of instabilities driven by the electron cloud, with results from simulation and analytical investigation in reasonable agreement. We review the results, which strongly suggest that serious consideration needs to be given to ways in which the effects of electron cloud can be mitigated.
NTIS
Linear Accelerators; Damping; Electron Clouds

20020076107 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Physics and properties of free - electron lasers
Krinsky,; May 06, 2002; 23p; In English
Report No.(s): DE2001-797623; BNL--69298; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We present an introduction to the operating principles of free-electron lasers, discussing the amplification process, and the requirements on the electron beam necessary to achieve desired performance.
NTIS
Free Electron Lasers; Field Theory (Physics); Beam Plasma Amplifiers; Beams (Radiation)

20020076175 Three-D-Computing, Inc., DeSoto, TX USA
Dedicated LHC collider Beauty experiment for precision measurements of CP-violation. LHC-B letter of intent
Crosetto, D. B.; Mar. 28, 1996; 6p; In English
Report No.(s): DE2001-762180; CERN/LHCC 95-5; LHCC/ I 8; No Copyright; Avail: Department of Energy Information Bridge
The LHC-B Collaboration proposes to build a forward collider detector dedicated to the study of CP violation and other rare phenomena in the decays of Beauty particles. The forward geometry results in an average 80 GeV momentum of reconstructed B-mesons and, with multiple, efficient and redundant triggers, yields large event samples. B-hadron decay products are efficiently identified by Ring-Imaging Cerenkov Counters, rendering a wide range of multi-particle final states accessible and providing precise measurements of all angles, (alpha), (beta) and (gamma) of the unitarity triangle. The LHC-B microvertex detector capabilities facilitate multi-vertex event reconstruction and proper-time measurements with an expected few-percent uncertainty, permitting measurements of B(sub s)-mixing well beyond the largest conceivable values of x(sub S). LHC-B would be fully operational at the startup of LHC and requires only a modest luminosity to reveal its full performance potential.
NTIS
Cp Violation; Imaging Techniques; Particle Decay; Particle Theory

20020076192 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Rhic vertical ac dipole commissioning.
Bai,; Delong,; Hoff,; Pai,; Peggs,; Jun. 02, 2002; 3p; In English
Report No.(s): DE2001-797119; BNL--68978; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The RHIC vertical ac dipole was installed in the summer of 2001. The magnet is located in the interaction region between sector 3 and sector 4 common to both beams. The resonant frequency of the ac dipole was first configured to be around half of the beam revolution frequency to act as a spin flipper. At the end of the RHIC 2002 run, the ac dipole frequency was reconfigured for linear optics studies. A 0.35 mm driven betatron oscillation was excited with the vertical ac dipole and the vertical betatron functions and phase advances at each beam position monitor (BPM) around the RHIC yellow ring were measured using the excited

coherence. We also recorded horizontal turn-by-turn beam positions at each BPM location to investigate coupling effects. Analysis algorithms and measurement results are presented.
NTIS
Dipoles; Alternating Current; Beams (Radiation); Oscillations

20020076204 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Cancellation Effects in CSR Induced Bunch Transverse Dynamics in Bends
Li, R.; Jun. 01, 2002; 3p; In English
Report No.(s): DE2001-797456; JLAB-ACP-02-03; DOE/ER/40150-2120; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The partial cancellation between the effect of centrifugal space charge force on transverse bunch dynamics and the potential energy effect has been a long-standing controversial issue in the study of coherent synchrotron radiation (CSR) induced bunch dynamics in bends. In this paper, we clarify our definition of the 'centrifugal space charge force' and discuss the meaning of the 'cancellation effect' and its general application. We further use simulation to demonstrate the cancellation in both steady state and transient regimes, and show the behavior of the effective transverse force.
NTIS
Coherent Radiation; Synchrotron Radiation; Computerized Simulation; Beam Interactions; Bunching

20020076206 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Rhic spin flipper commissioning.
Bai,; Mackay, W.; Ranjbar,; Roser,; Jun. 02, 2002; 3p; In English
Report No.(s): DE2001-797120; BNL--69233; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An ac dipole with horizontally oriented oscillating magnetic field (spin flipper) was installed in FU-IIC to reverse the spin direction in the presence of two full Siberian snakes, thereby reducing the systematic errors for the spin physics experiments in RHIC. With two full snakes, the spin vector completes one full precession around the vertical direction in two revolutions, and the spin depolarization resonances due to the machine imperfections and betatron oscillations are eliminated. Since the spin flipper provides an oscillating horizontal dipole field, a 'spin resonance' can occur if the spin flipper frequency is placed in the neighborhood of the spin precession frequency (1,2,3). by slowly sweeping the spin flipper frequency across the spin precession frequency, a full spin flip can be achieved. This paper reports the results of the FZUC spin flipper commissioned during the RHIC 2002 polarized proton run. by running the spin flipper at a slightly different configuration, one can also measure the spin precession tune.
NTIS
Alternating Current; Dipoles; Depolarization; Magnetic Fields; Spin

20020076219 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Longitudinal impedance measurement in rhic.
Blaskiewicz,; Brennan, M.; Cameron,; Fischer,; Jun. 02, 2002; 4p; In English
Report No.(s): DE2001-797118; BNL--68939; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The very clean Schottky spectra of gold beams in RHIC allow an accurate measurement of potential well distortion. by observing the variation in the small amplitude, incoherent synchrotron tune with intensity and bunch length, the intensity dependent longitudinal force can be measured. Dynamical effects associated with coherent motion are not important though some new dynamical effects appear. Measurements were carried out both at injection energy and store, which allowed the space charge and wall contributions to be individually determined.
NTIS
Impedance; Impedance Measurement; Synchrotrons

20020076220 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Vacuum pressure rise with intense ion beams in rhic.
Fischer,; Bai,; Brennan, M.; Blaskiewicz,; Cameron,; Jun. 02, 2002; 3p; In English
Report No.(s): DE2001-797116; BNL--68937; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

When RHIC is filled with bunches of intense ion beams a pressure rise is observed. The pressure rise exceeds the acceptable limit for operation with the design intensities. Observations of events leading to a pressure rise are summarized. Relevant parameters include ion species, charge per bunch, bunch spacing, and the location in the ring. Effects that contribute to a pressure

rise are discussed, including beam gas ionization and ion desorption, loss-induced gas desorption, and electron desorption from electron clouds.
NTIS
Ion Beams; Electron Clouds; Gas Ionization; Ion Charge

20020076222 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Collimator design for the hebt line of the sns project.
Simos,; Ludewig,; Raparia,; Catalan-Lasheras,; Brodowski,; Jun. 03, 2002; 3p; In English
Report No.(s): DE2001-797134; BNL--69025; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
This paper summarizes the design of the HBBT clean-up system consisting of a combination of charge exchange foils and absorbers. Pairs of foils moving in-and-out of the beam in both planes help guide the halo protons into respective absorbers that feature a double wall beam-tube, a water-cooled particle bed responsible and heavy radial shielding. Off-momentum protons are directed to a momentum dump via similar charge exchange foils and in combination with a dipole magnet. The paper addresses the survivability of the double beam tube in the absorber and the special window in the momentum dump that intercept halo protons over a relatively small footprint under normal operating conditions and potentially full beam under accident conditions.
NTIS
Charge Exchange; Collimators; Liquid Cooling

20020076229 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Laser beam profile monitor development at bnl for sns.
Connolly,; Cameron,; Cupolo,; Gassner,; Grau,; May 06, 2002; 12p; In English
Report No.(s): DE2001-797123; BNL--69258; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
A beam profile monitor for H-beams based on laser photoneutralization is being developed at Brookhaven National Laboratory (BNL) for use on the Spallation Neutron Source (SNS) (l). An H ion has a first ionization potential of 0.75eV and can be neutralized by light from a Nd:YAG laser (h=1064nm). To measure beam profiles, a narrow laser beam is passed through the ion beam neutralizing a portion of the H-beam struck by the laser. The laser trajectory is stepped across the ion beam. At each laser position, the reduction of the beam current caused by the laser is measured. A proof-of-principle experiment was done earlier at 750keV. This paper reports on measurements made on 200MeV beam at BNL and with a compact scanner prototype at Lawrence Berkeley National Lab on beam from the SNS RFQ.
NTIS
Beam Currents; Neodymium Lasers; Laser Beams; Ion Beams; YAG Lasers

20020076230 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Development and applications of the ual based sns ring simulation environment
Malitsky,; Cameron,; Fedotov, V.; Smith,; Wei,; Apr. 08, 2002; 3p; In English
Report No.(s): DE2001-797139; BNL--69272; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The SNS Ring off-line parallel simulation environment based on the Unified Accelerator Libraries (UAL) has en implemented and used for extensive full-scale beam dynamics studies arising in high-intensity ring. The paper describes the structure of this environment and its application to various high-intensity topics and diagnostics modeling.
NTIS
Computerized Simulation; Accelerators; Beams (Radiation); Unified Field Theory

20020076233 Fermi National Accelerator Lab., Batavia, IL USA
Coherent synchrotron radiation: Theory and experiments
Bohn, C. L.; Jul. 19, 2002; 15p; In English
Report No.(s): DE2001-797301; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
Our understanding of the generation of coherent synchrotron radiation in magnetic bending systems and its impact on beam dynamics has grown considerably over the past few years. The search for understanding has brought a number of surprises, all related to the complexity of the fully self-consistent problem. Herein I survey the associated phenomenology, theory, and experiments while emphasizing important subtleties that have recently been uncovered. I conclude by speculating on courses of future investigations that may prove fruitful.
NTIS
Coherent Radiation; Phenomenology; Synchrotron Radiation; Field Theory (Physics)

20020076234 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Diagnostics for Recirculating and Energy Recovery Linacs
Krafft, G.; Denard, J.-C.; May 01, 2002; 16p; In English
Report No.(s): DE2001-797454; JLAB-ACP-02-02; DOE/ER/40150-2119; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In this paper, the electron beam diagnostics developed for recirculating electron accelerators will be reviewed. The main novelties in dealing with such accelerators are: to have sufficient information and control possibilities for the longitudinal phase space, to have means to accurately set the recirculation path length, and to have a means to distinguish the beam passes on measurements of position in the linac proper. The solutions to these problems obtained at Jefferson Laboratory and elsewhere will be discussed. In addition, more standard instrumentation (profiling and emittance measurements) will be reviewed in the context of recirculating linacs. Finally, and looking forward, electron beam diagnostics for applications to high current energy recovered linacs will be discussed.
NTIS
Electron Beams; Emittance; Linear Accelerators; Energy Technology

20020076254 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA
Production of an Accelerated Oxygen-14 Beam
Powell, J.; O'Neil, J. P.; Cerny, J.; 2002; 14p; In English
Report No.(s): DE2002-796105; LBNL-50223; No Copyright; Avail: Department of Energy Information Bridge

BEARS is an ongoing project to provide a light-ion radioactive-beam capability at the 88-Inch Cyclotron at LBNL. Light radioactive isotopes are produced at a 10 MeV proton medical cyclotron, transported 350 m via a high-speed gas transport capillary, cryogenically separated, and injected into the 88-Inch Cyclotron's ion source. The first radioactive beam successfully accelerated was Carbon-11 and beams of intensity more than 108 ions/sec have been utilized for experiments. Development of Oxygen-14 as the second BEARS beam presented considerable technical challenges, both due to its short half-life of 71 seconds and the radiation chemistry of oxygen in the target.
NTIS
Cyclotrons; Oxygen Isotopes; Light Beams; Radiation Chemistry

20020076291 Ames Lab., IA USA
Nonphotochemical Hole-Burning Studies of Energy Transfer Dynamics in Antenna Complexes of Photosynthetic Bacteria
Matsuzaki, S.; Aug. 01, 2002; 42p; In English
Report No.(s): DE2001-797635; IS-T 2110; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We present an introduction to the operating principles of free-electron lasers, discussing the amplification process, and the requirements on the electron beam necessary to achieve desired performance.
NTIS
Electron Beams; Free Electron Lasers; Energy Transfer

20020076425 Fermi National Accelerator Lab., Batavia, IL USA
Beam collimation and shielding in the Fermilab proton driver
Drozhdin, A. I.; Mokhov, N. V.; Jun. 28, 2002; 3p
Report No.(s): DE2001-795757; No Copyright; Avail: Department of Energy Information Bridge

A high beam power in the proposed Fermilab Proton Drivers--1.2 MW in 16-GeV PD-I and 0.48 MW in 8-GeV PD-II--implies serious constraints on beam losses in these machines. Only with a very efficient beam collimation system can one reduce uncontrolled beam losses in the machine to an allowable level. The entire complex must be well shielded to allow acceptable hands-on maintenance conditions in the tunnel and a non-controlled access to the outside shielding at normal operation and accidental beam loss. Collimation and shielding performances are calculated and compared for both Proton Drivers.
NTIS
Particle Accelerators; Collimation; Particle Beams

20020076427 Fermi National Accelerator Lab., Batavia, IL USA
Field quality of the Fermilab NB3SN cos-theta dipole models
Barzi, E.; Jun. 28, 2002; 3p; In English
Report No.(s): DE2001-795761; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Three short Nb3Sn dipole models based on a single-bore cos-theta coil and a cold iron yoke have been fabricated and tested at Fermilab. This paper summarizes the results of magnetic measurements in those models. The geometrical harmonics, coil magnetization effects, cable eddy currents with and without a stainless steel core, and the 'snap-back' effect at injection are presented.
NTIS
Dipoles; Magnetic Measurement; Harmonics; Eddy Currents; Niobium; Tin

20020076428 Fermi National Accelerator Lab., Batavia, IL USA
Targetry issues for the Fermilab 2-MW neutrino superbeam
Kostin, M. A.; Jun. 27, 2002; 3p; In English
Report No.(s): DE2001-795666; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The possibility to use various target materials are studied for a 2 MW neutrino superbeam facility that can be built at Fermilab utilizing the Main Injector and a Proton Driver. A simple target solution found is a thick graphite rod taking a broad proton beam.
NTIS
Particle Accelerators; Proton Beams; Particle Accelerator Targets; Neutrino Beams

20020077665 Argonne National Lab., IL USA
Simulations of electron cloud build-up and saturation in the APS
Harkay, K.; Rosenberg, R.; Furman, M.; Pivi, M.; Jun. 13, 2002; 5p; In English
Report No.(s): DE2001-795804; ANL/ASD/CP-107954; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
In studies with positron beams in the Advanced Photon Source, a dramatic amplification was observed in the electron cloud for certain bunch current and bunch spacings. In modeling presented previously, we found qualitative agreement with the observed beam-induced multipacting condition, provided reasonable values were chosen for the secondary electron yield parameters, including the energy distribution. In this paper, we model and discuss the build-up and saturation process observed over long bunch trains at the resonance condition. Understanding this saturation mechanism in more detail may have implications for predicting electron cloud amplification, multipacting, and instabilities in future rings.
NTIS
Positrons; Particle Beams; Electron Clouds; Amplification

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OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20020074272 Communications Research Lab., Japan
Photonic Research Activity at CRL
Itabe, Toshikazu, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 3-6; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity
Researches on photonic technology from device to system have been performing in Basic and Advanced Research Division of CRL. The researches cover wide area of projects from the technologies for its utilization to the future communication technologies. This special issue on the photonic technology is presented the research doing at the Koganei area of the Basic and Advanced Research Division.
Author
Photonics; Networks

20020074362 Communications Research Lab., Japan
Research and Development of Photonic Feeding Antennas
Li, Keren, Communications Research Lab., Japan; Cheng, Chong Hu, Communications Research Lab., Japan; Izutsu, Masayuki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 37-44; In Japanese; Copyright; Avail: Issuing Activity
In this paper, we presented our recent works on development of photonic feeding coplanar patch antennas for microwave and millimeter-wave wireless communication system. An experiment setup for optical modulation of sub-carries, photodetection of the sub-carrier-modulated optical wave and integration of the photodetector with a coplanar patch antenna have been described.

Experimental results of optical modulation using a traveling-wave LiNbO3 optical modulator, RF output from a photodetector: UTC-PD, and the RIF output dependence on modulation index have been presented and discussed. The experiment showed that the photodetector can generate relatively large RIF power at microwave and millimeter-wave frequencies, for example, more than 10 mW at both 10GHz and 20GHz and around 10 mW at 38GHz and 60GHz. Based on this experimental fact, we introduced a concept of direct integration of an antenna with the photodetector to realize a simple photonic feeding RF radiation unit to avoid serious transmission loss and simplify the RF system especially in high frequency wireless system. A planar antenna: coplanar patch antenna was newly proposed and designed for the direct integration with the photodetector which is of a coplanar waveguide output structure. Simulation, design, fabrication and measurement have been done for the antennas, including some new structure for broadband operation. Experiment on a hybrid integration of the photodetector and the coplanar patch antenna demonstrated a good performance of photonic microwave generating, direct feeding, transmitting and receiving. The results clearly showed the effectiveness and the potential application of our integration configuration to the future microwave and millimeter-wave wireless communication system based on the optical fiber network.
Author
Research and Development; Photonics; Fabrication; Traveling Wave Modulation; Planar Structures; Photometers; Patch Antennas; Optical Fibers

20020074363 Communications Research Lab., Japan
Optical Code Division Multiplexing and its Application to Peta-bit/s Photonic Network
Sotobayashi, Hideyuki, Communications Research Lab., Japan; Chujo, Wataru, Communications Research Lab., Japan; Kitayama, Ken-ichi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 7-19; In Japanese; Copyright; Avail: Issuing Activity

Future ultrafast photonic networks will perform transferring signals in the optical layer. The target of the photonic networks is to provide services at data rates much higher than electronic network can. Ultrafast photonic processing is expected to play a key role in future peta-bit/s photonic networks. Because ultrafast photonic processing could advantageously remove the speed limit that electronics imposes severe technology and economic constraints. Applications of optical code division multiplexing (OCDM) to multi-tera bit/s photonic network based on ultrafast photonic processing are reported. A high spectrum efficiency OCDM/WDM transmission as a link technology, and a transparent virtual optical code/wavelength path (VOC/VWP) network as a node technology are experimentally demonstrated.
Author
Optical Paths; Code Division Multiplexing; Photonics; Networks

20020074364 Communications Research Lab., Japan
Resonant Type Optical Modulators for 10 GHz band
Kawanishi, Tetsuya, Communications Research Lab., Japan; Oikawa, Satoshi, Communications Research Lab., Japan; Higuma, Kaoru, Communications Research Lab., Japan; Matsuo, Yoshiro, Communications Research Lab., Japan; Izutsu, Masayuki, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 73-79; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

For band-type operations such as radio-on-fiber systems, effective optical modulation can be obtained by using resonant structures. In this paper, we propose a resonant-type optical modulator consisting of a simple planar structure, whose modulation efficiency is larger than that of conventional modulators. The normalized induced phase of the fabricated modulator has a peak of 3.41 at 10 GHz, and the half wave voltage is 13.7V, while the length of the modulating electrode is 3.25 mm.
Author
Resonators; Modulators; Light Modulation; Optical Equipment

20020074367 Communications Research Lab., Japan
Ultra-fast Photonic Packet Routing Technology
Wada, Naoya, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 21-35; In Japanese; Original contains color illustrations; Copyright; Avail: Issuing Activity

The great proliferation of the Internet has led to massive data exchanges between terminals such as computers and cellular phones. This growth in information exchange has resulted in a need for higher speed, larger capacity, and enhanced functionality of the information communications network that serves as the basis of data exchange. A photonic network, in which information is transmitted by light, is essential if we hope to the implementation of an ultra-fast, ultra-high capacity network that meets consumer demands. This paper reviews photonic routing technology, describes the concept of photonic packet routing technology employing optical orthogonal encoding labels, and then discusses our research into this technology. Also outlined are the concept

and results of a proof -of- principle experiment of photonic packet routing technology using a multi-wavelength label, which is an improved system of MP-Lambda-S (Multi-Protocol Wavelength Switching). This paper concludes with an outline of and results from a proof -of-principle experiment of photonic label processing technology using spectral holography. Photonic packet routing technology is a means of applying optical information technology to optical communications systems, and is expected to further develop in the future.
Author
Communication Networks; Computers; Holography; Information Systems; Optical Communication

20020074369 Communications Research Lab., Japan
Distorted Image Reconstruction Using Photorefractive Effects
Zhang, Jiasen, Communications Research Lab., Japan; Yoshikado, Shin, Communications Research Lab., Japan; Aruga, Tadashi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 67-71; In Japanese; Copyright; Avail: Issuing Activity

A new method of distorted image reconstruction through a turbulent medium is demonstrated using photorefractive effects. In this method, there are only one object beam and one sampling beam. The images, reconstructed with high-fidelity, are picked up.
Author
Image Reconstruction; Turbulence

20020074370 Communications Research Lab., Japan
A Novel Optical Heterodyne Detection Technique for 60-GHz-Band Radio-on-Fiber Systems
Kuri, Toshiaki, Communications Research Lab., Japan; Kitayama, Ken-ichi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 45-56; In Japanese; Copyright; Avail: Issuing Activity

A novel method for optical heterodyne detection in millimeter-wave-band radio-on-fiber systems is described. The key to detection is to use a remote dual-mode local light. Although the light is free-running, our method is in principle free from laser phase noise. This method is also theoretically immune from the fiber-dispersion effect, because only two components of the optical signal are selected out by the local light to demodulate themselves. This immunity persists even if the transmitted optical signal is in the double-sideband format. We derive the theoretical limit of the system performance and experimentally demonstrate a 25-km-long fiber-optic transmission and the optical heterodyne detection of a 59.6GHz radio-on-fiber signal using 155.52-Mb/s DPSK-formatted data.
Author
Detection; Fiber Optics; Optical Heterodyning; Radio Signals

20020074558 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Validity of the Relation Between Spontaneous and Stimulated Emissions in Semiconductors
Ning, Cun-Zheng, MRJ Technology Solutions, Inc., USA; [1999]; 1p; In English; Photonics West, 23-29 Jan. 1999, San Jose, CA, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

The Einstein relation between spontaneous emission and absorption was originally derived for a system consists of a two-state subsystem representing matter and harmonic fields representing radiation. The derivation is based on the detailed balance between these two subsystems under thermal equilibrium. The relationship was later investigated in connection with the interactions between radiation field and solids or semiconductors. The simple derivation dose not hold for semiconductors in general. In certain limiting cases, simple relation was obtained. The validity of this relation is important not only because of its fundamental role connecting two of the most fundamental optical processes in semiconductors, but mostly also because of its wide use as a practical method to measure the optical gain of a semiconductor. The validity of this relation for semiconductors has been an issue of controversial for some time. In this paper we numerically examine the validity of this relationship for several different lineshapes including Lorentzian, Gaussian, Sech, and a convoluted double Lorentzians (CDL). We find out that at relatively low density above transparency level, all first three lineshapes violate the Einstein relation. The relation is approximately valid at high density. At very high density, the validity of the Einstein relation holds well for all three lineshapes. The reason behind this observation is explained. The CDL lineshape has been shown analytically to obey the Einstein relationship previously. We show that for a 2D

semiconductor with parabolic bands, the CDL lineshape can be integrated analytically. This analytic lineshape is compared with a simple Lorentzian lineshape.
Author
Spontaneous Emission; Radiation Absorption; Thermodynamic Equilibrium; Harmonic Radiation

20020074585 Sequoia Scientific, Inc., Mercer Island, WA USA
Remote-Sensing Retrieval of Oceanic Inherent Optical Properties by Inversion of the Radiative Transfer Equation ***Final Report, Aug. 2001-Jul. 2002***
Mobley, Curtis D.; Sundman, Lydia K.; Jul. 2002; 34p; In English; Original contains color images
Contract(s)/Grant(s): N00014-01-M-0268
Report No.(s): AD-A404856; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A shape-factor formulation of the radiative transfer equation (RTE) is developed to yield exact expressions for the remote sensing reflectance, R(sub rs), and the equivalent remotely sensed reflectance, RSR(sub alpha). This form of the RTE is configured for inherent optical property (IOP) retrievals via standard linear matrix inversion methods. Our inversion algorithm for the shape-factor RTE is exact in the sense that no approximations are made to the RTE. Thus errors in retrieved inherent optical properties (IOPs) are produced only by uncertainties within: (1) the models for the shape factors and related quantities and (2) the lop models required for inversion. Hydrolight radiative transfer calculations are used to derive analytical models for the various shape factors and related quantities for Case 1 waters. These shape factor models can predict the shape factors with accuracies ranging typically from two to 20%. Using the modeled shape factors, we are able to predict the in-air remotely sensed reflectance RSR(sub alpha) to within 20% of the correct (Hydrolight-computed) values 96% of the time for the synthetic data used to determine the shape factor models, and to predict RSR alpha to within 0,0005/sr 86% of the time.
DTIC
Optical Properties; Radiative Transfer; Remote Sensing

20020074603 Communications Research Lab., Hokkaido, Japan
Ultrafast Electron Control of Optical Device
Hasegawa, Atsushi, Communications Research Lab., Japan; Mitsumori, Yasuyoshi, Communications Research Lab., Japan; Review of the Communications Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 95-100; In Japanese; Copyright; Avail: Issuing Activity

The many-body effect of the excitons in the semiconductor quantum dots is investigated in the frequency and time regions. The Rabi oscillation of the exciton in the semiconductor quantum dots is observed by the stimulated photon echo method. This is the first direct observation of the Rabi oscillation of the excitons. The signal intensity changes periodically with the excitation intensity. The sharp spectrum from the single quantum dot is also observed by the micro-photoluminescence. The existence of phonon bottleneck is clarified from the temporal shape of the photoluminescence signal. These results show that the quantum dots is one of the good candidates for the device of the quantum computation.
Author
Electrons; Optical Equipment; Many Body Problem; Semiconductors (Materials); Quantum Dots; Oscillations; Control Equipment

20020074733 Kharkov Astronomical Observatory, Kharkov, Ukraine
Backscatter Effects of Particles with Perfect and Irregular Shapes: Geometric Optics Approach
Grynko, Ye., Kharkov Astronomical Observatory, Ukraine; Shkuratov, Yu., Kharkov Astronomical Observatory, Ukraine; Solar System Remote Sensing; 2002, pp. 21-22; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

To interpret the opposition phenomena observed for regolith surfaces optical properties of individual particles should be studied. Even under neglecting diffraction, the problem of light scatter by particles of irregular shape is rather complex. Using the computer ray-tracing method, we investigate here brightness and polarization backscatter effects of particles with different shapes in the geometric optics approximation.
Author
Backscattering; Geometrical Optics; Ray Tracing; Computerized Simulation; Grain Size; Planetary Surfaces; Models

20020074758 Grenoble-1 Univ., Laboratoire de Planetologie de Grenoble, France

Dependence of the Spectral BRDF of Sulfur Surfaces with Material Texture: Laboratory Measurements with the Spectrophoto-Goniometer at LPG

Schmitt, B., Grenoble-1 Univ., France; Bonnefoy, N., Grenoble-1 Univ., France; Brissaud, O., Grenoble-1 Univ., France; Doute, S., Grenoble-1 Univ., France; Solar System Remote Sensing; 2002, pp. 71-72; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The exploration of the surfaces of solar system bodies (planets, satellite, asteroids, ...) now systematically involves observations by imagers and imaging spectrometers over the UV, visible and near-infrared ranges. All along the missions the light reflected by the surface is recorded under various illumination/observation geometries, often constrained by the spacecraft orbit. Large changes of reflectance and spectral contrast with phase angle are generally observed for a given area. Also, contrary to terrestrial snow or ice fields, a tendency for backscattering behavior is widely found for the surfaces of the icy satellites. In particular, Io's Jupiter satellite displays very strong contrast reversals between surface units at low and high phase angles. This behavior seems to be linked to very different BRDF (bidirectional reflectance distribution function) for the various materials constituting its volcanic surface dominated by sulfur compounds and SO2 frost. Several 'a priori' interpretations have been proposed for this peculiar behavior but none has been theoretically modeled or tested experimentally. The correct interpretation of the spectra produced by the imaging spectrometers under varied geometries first requires to be able to 'correct' for these bidirectional effects. If sufficiently sampled, the BRDF of a planetary surface also potentially contain interesting textural information on its constituting materials. However, first of all laboratory investigations are clearly needed in order to understand the physical and textural parameters that control the BRDF. For that purpose a spectrophoto-goniometer has been designed at LPG to measure the spectral bidirectional reflectance distribution function (SBRDF) of granular and compact geophysical surfaces. The instrument covers the solar spectrum, from 0.3 to 5 microns, and enables a wide range of bidirectional configurations. Author

Bidirectional Reflectance; Distribution Functions; Planetary Surfaces; Astronomical Spectroscopy

20020074763 Kharkov Astronomical Observatory, Kharkov, Ukraine

Light Scatter by Particulate Surfaces with Different Topography

Stankevich, D., INTAS; Shkuratov, Yu., INTAS; Pinet, P., Observatoire de Midi-Pyrenees, France; Cord, A., Observatoire de Midi-Pyrenees, France; Solar System Remote Sensing; 2002, pp. 81-82; In English; Also announced as 20020074722

Contract(s)/Grant(s): INTAS-2000-0792; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Significant increase of the spatial resolution of optical experiments on and near the planetary surfaces, e.g., in-situ measurements for Mars Pathfinder mission and soon-to-come orbital high resolution multispectral observations for Mars Express mission, demands efforts in laboratory and theoretical simulations of imaging spectrophotometric studies to interpret physical and mineralogical characteristics of the planetary surfaces. For this reason a new spectral imaging facility has been designed and settled since April 2000 at the Observatory Midi-Pyrenees. This is intended to help the definition of new spaceborne instruments, to simulate planetary observations, and to improve the understanding of the effects of observational conditions and of physical properties on the bidirectional reflectance of rocky surfaces and soils. Attempts to interpret laboratory measurements carried out with the facility using the standard photometric model by Hapke. Sometimes it may result in non-unique solution with ambiguous physical interpretation. Hapke's model implicitly considers that the scale of surface topography is much larger than the size of regolith particles handled as a particulate medium. Besides, this topography is described with the Gaussian statistics. However, in laboratory and in-situ planetary measurements one deals with surface topographies that have the characteristic scale comparable with the size of regolith particles, and often such meso-scale topographies are formed by rock fragments. to study this effect, we carried out a computer modeling of multiple light scattering in particulate media complicated by rocky topographies and by a single-valued random surface with the characteristic scale of order of particle size. The geometric optics approximation is used. Author

Light Scattering; Particulates; Planetary Surfaces; Planetary Composition; Spectrophotometry; Topography

20020076096 Lambda Research Corp., Littleton, MA USA

Stray Light Analysis

Spinoff 1997; 1997, pp. 105; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Based on a Small Business Innovation Research contract from the Jet Propulsion Laboratory, TracePro is state-of-the-art interactive software created by Lambda Research Corporation to detect stray light in optical systems. An image can be ruined by incidental light in an optical system. to maintain image excellence from an optical system, stray light must be detected and eliminated. TracePro accounts for absorption, specular reflection and refraction, scattering and aperture diffraction of light.

Output from the software consists of spatial irradiance plots and angular radiance plots. Results can be viewed as contour maps or as ray histories in tabular form. TracePro is adept at modeling solids such as lenses, baffles, light pipes, integrating spheres, non-imaging concentrators, and complete illumination systems. The firm's customer base includes Lockheed Martin, Samsung Electronics and other manufacturing, optical, aerospace, and educational companies worldwide.
Author
Imaging Techniques; Lenses; Baffles; Concentrators; Optical Equipment; Computer Programs

20020076104 Fermi National Accelerator Lab., Batavia, IL USA
Modular optics design for the NuMI beamline
Johnstone, J. A.; Jul. 23, 2002; 9p; In English
Report No.(s): DE2001-797448; FERMILAB-TM-2174; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Nu MI beamline discussed here is a modular optics design, characterized by 4 sections: MI (yields) beamline matching; periodic FODO cells; a special insertion to traverse the carrier pipe, and a versatile final focus section to produce the desired spot-size on the target. The use of 21 quadrupoles ensures that beam size is constrained within acceptable bounds throughout the line--(beta) < 60 m in the MI matching section & FODO cells, (beta) < 125 m in the doublets of the carrier pipe insertion, and (beta) < 100 m in the final focus. Lattice functions of the NuMI design are not unusually sensitive to errors arising either from MI optical mismatches or gradient errors, and are completely correctable through the 2 matching sections. Aperture studies indicate that the line is able to transport the worst quality beam that the Main Injector might provide. Dipole correctors at 19 of the 21 focusing centers are available to provide high-quality orbit control & further ensure that the NuMI line meets the stringent requirements for environmental protection.
NTIS
Quadrupoles; Optics; Apertures; Injectors

20020076131 Sensiv, Inc., Waltham, MA USA
Infrared Fiber Optic Sensors
Spinoff 1997; 1997, pp. 93; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

Successive years of Small Business Innovation Research (SBIR) contracts from Langley Research Center to Sensiv Inc., a joint venture between Foster-Miller Inc. and Isorad, Ltd., assisted in the creation of remote fiber optic sensing systems. NASA's SBIR interest in infrared, fiber optic sensor technology was geared to monitoring the curing cycles of advanced composite materials. These funds helped in the fabrication of an infrared, fiber optic sensor to track the molecular vibrational characteristics of a composite part while it is being cured. Foster-Miller ingenuity allowed infrared transmitting optical fibers to combine with Fourier Transform Infrared spectroscopy to enable remote sensing. Sensiv probes operate in the mid-infrared range of the spectrum, although modifications to the instrument also permits its use in the near-infrared region. The Sensiv needle-probe is built to be placed in a liquid or powder and analyze the chemicals in the mixture. Other applications of the probe system include food processing control; combustion control in furnaces; and maintenance problem solving.
Author
Remote Sensing; Curing; Composite Materials; Food Processing; Combustion Control; Optical Fibers; Infrared Detectors; Fiber Optics; Fabrication

20020077664 NASA Marshall Space Flight Center, Huntsville, AL USA
Panoramic Refracting Optic
Lindner, Jeffrey L., Inventor, NASA Marshall Space Flight Center, USA; Jul. 23, 2002; 8p; In English
Patent Info.: Filed 28 Jul. 2000; NASA-Case-MFS-31475-1; US-Patent-6,424,470; US-Patent-Appl-SN-616624; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An optical device having a semi-spherical or hemispherical field-of-view is provided. A conically-shaped piece of optical material has an annular surface satisfying Snell's Law for total internal reflection with respect to light passing through the piece and incident on the annular surface from within the piece.
Official Gazette of the U.S. Patent and Trademark Office
Optical Materials; Refraction; Optics; Field of View

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PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20020075573 Army Research Lab., Aberdeen Proving Ground, MD USA
Characterization of Plasma Jet Flows and Their Interaction with Propelling Charges
Chang, Lang-Mann, Army Research Lab., USA; Howard, Stephen L., Army Research Lab., USA; Beyer, Richard A., Army Research Lab., USA; 38th JANNAF Combustion Subcommittee Meeting; April 2002; Volume 1, pp. 299-316; In English; Also announced as 20020075551; Copyright; Avail: CPIA, 10630 Little Patuxent Pkwy., Suite 202, Columbia, MD 21044-3200 HC

Experiments have been conducted to observe the flow patterns of plasma jets in the open air effused from a capillary with single and multiple vent holes. Investigations have also been made into the plasma flow interaction with a propellant bed (in granular and disk configurations) in a closed chamber that simulates a 25-mm cannon combustion chamber. Results show the detailed shock structure in the plasma flow field consisting of a barrel shock, a Mack disk, and a precursor shock. Similar flow structure also appears in each of the plasma jets effused from the multiple vent holes of an extension tube attached to the capillary exit end. Like the case of using a conventional igniter, the energy deposit by a plasma jet flow into a densely-packed granular propellant charge is limited to the region surrounding the plasma venting. An extension tube can greatly improve the uniformity of ignition stimulus. Results also indicate that an appropriate gap width between adjacent disks is required in a disk propellant charge in order to achieve effective ignition. An interesting flow field with a shock structure analogous to that appearing in an open-air jet has been observed in a conceptual disk propellant charge. Furthermore, there exist several hot regions along the propellant bed, and this has important ballistic implications associated with the generation of pressure waves as well as ballistic performance. The present study suggests that plasma ignition systems need to be individually optimized (such as configuration, energy output ...) for given charge systems in order to ensure operational safety and high ballistic performance.
Author
Plasma Jets; Flow Distribution; Magnetohydrodynamic Flow; Propellants; Interactions

20020076014 Argonne National Lab., IL USA
Development of comprehensive and integrated models for inertial fusion cavity dynamics.
Hassanein, A.; Morozov, V.; May 17, 2002; 48p; In English
Report No.(s): DE2001-795895; ANL-ET/02-04; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The chamber walls in inertial fusion energy (IFE) reactors are exposed to harsh conditions following each target implosion. Key issues of the cyclic IFE operation include intense photon and ion deposition, wall thermal and hydrodynamic evolution, wall erosion and fatigue lifetime, and chamber clearing and evacuation to ensure chamber conditions prior to target implosion. Several methods for wall protection have been proposed in the past, each having its own advantages and disadvantages. These methods include bare walls, gas-filled cavities, and liquid walls/jets. We have developed detailed models for reflected laser light, emitted photon, and target debris deposition and interaction with chamber components and implemented them in the comprehensive HEIGHTS software package. The hydrodynamic response of gas-filled cavities and photon radiation transport of the deposited energy has been calculated using new and advanced numerical techniques. Fragmentation models of liquid jets as a result of the deposited energy have also been developed, and the impact on chamber clearing dynamics has been evaluated. The focus of this study is to critically assess the reliability and the dynamic response of chamber walls in various proposed protection methods in IFE systems. of particular concern is the effect on wall erosion lifetime of various erosion mechanisms, such as vaporization, chemical and physical sputtering, melt/liquid splashing and explosive erosion, and fragmentation of liquid walls. Mass loss and fragmentation in the form of macroscopic particles can be much larger than mass loss due to surface vaporization and sputtering and have not been properly considered in past studies as part of the overall cavity response and reestablishment. This effect may significantly alter cavity dynamics and power requirements.
NTIS
Cavities; Inertial Fusion (Reactor); Dynamic Response; Energy Transfer; Gas Transport; Implosions

20020076422 Princeton Univ., Plasma Physics Lab., NJ USA
Properties of Compressional Alfven Eigenmode Instability Driven by Superalfvinic Ions
Gorelenkov, N.; Cheng, C. Z.; Feb. 06, 2002; 17p; In English
Report No.(s): DE2001-795785; PPPL-3667; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Properties of the instability of Compressional Alfven Eigenmodes (CAE) in tokamak plasmas are studied in the cold plasma approximation with an emphasis on the instability driven by the energetic minority Ion Cyclotron Resonance Heating (ICRH)

ions. We apply earlier developed theory to compare two cases: Ion Cyclotron Emission (ICE) driven by charged fusion products and ICRH Minority driven ICE (MICE). Particularly in MICE spectrum, only instabilities with even harmonics of deuterium-cyclotron frequency at the low-field-side plasma edge were reported. Odd deuterium-cyclotron frequency harmonics of ICE spectrum between the cyclotron harmonics of protons can be driven only via the Doppler-shifted cyclotron wave-particle resonance of CAEs with fusion products, but are shown to be damped due to the electron Landau damping in experiments on MICE. Excitation of odd harmonics of MICE with high-field-side heating is predicted. Dependencies of the instability on the electron temperature is studied and is shown to be strong. Low electron temperature is required to excite odd harmonics in MICE.
NTIS
Cold Plasmas; Heating; Cyclotrons; Ion Cyclotron Radiation; Harmonics

20020076462 Princeton Univ., Plasma Physics Lab., NJ USA
Compressional Alfvin Eigenmode Dispersion in Low Aspect Ratio Plasmas
Gorelenkov, N. N.; Cheng, C. Z.; Fredrickson, E.; Jan. 29, 2002; 17p; In English
Report No.(s): DE2001-795724; PPPL-3663; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Recent observations of new fast ion beam driven instabilities in MHz frequency range in National Spherical Torus experiments (NSTX) are suggested to be Compressional Alfvin Eigenmodes (CAEs). A new theory of CAEs applicable to low aspect ratio toroidal plasmas is developed based on the ballooning representation for the poloidal dependence of the perturbed quantities. In agreement with observations, the analytical theory predicts that CAEs are discrete modes with frequencies correlated with the characteristic Alfvin velocity of the plasma. Plasma equilibrium structure is essential to determine accurately the dispersion of CAEs. The mode structure is localized in both the minor radius and the poloidal directions on the low magnetic field side.
NTIS
Plasmas (Physics); Ion Beams

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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.

20020074775 Naval Postgraduate School, Monterey, CA USA
Two-Dimensional Modeling of Aluminum Gallium Nitride/Gallium Nitride High Electron Mobility Transistor
Holmes, Kenneth L.; Jun. 2002; 79p; In English; Original contains color images
Report No.(s): AD-A404952; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Gallium Nitride (GaN) High Electron Mobility Transistors (HEMT's) are microwave power devices that have the performance characteristics to improve the capabilities of current and future Navy radar and communication systems. The Office of Naval Research (ONR) is funding research for the development of GaN-based microwave power amplifiers for use in future radar and communication systems. This thesis studies the effects of AIGaN/GaN HEMTs' polarization, piezoelectric (PZ) and spontaneous, properties utilizing the TM commercially available Silvaco Atlas software for modeling and simulation. The polarization properties are suspected to enhance the two-dimensional electron gas (2DEG) at the AIGaN/GaN interface.
DTIC
Theses; High Electron Mobility Transistors; Gallium Nitrides

20020074782 Minnesota Mining and Mfg. Co., Saint Paul Corporate Research Lab., Saint Paul, MN USA
Monte Carlo Modeling of YBCO Vapor Deposition
Fan, Jing; Boyd, Iain D.; Shelton, Chris; Jul. 2000; 8p; In English; See Also ADM001341, Rarefied Gas Dynamics (RGD) International Symposium (22d) held in Sydney, Australia, 9-14 July 2000. Prepared in cooperation with Dept. of Aerospace Engineering, Univ. of Michigan, Ann Arbor, MI. Pub. in CP585
Contract(s)/Grant(s): N00014-98-3-0015
Report No.(s): AD-A405154; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A three dimensional electron beam physical vapor deposition process of superconducting films of YBa2Cu3O7-(sub delta) in a vacuum chamber is investigated both computationally and experimentally. The numerical analysis employs the direct simulation Monte Carlo (DSMC) method. Some important modeling issues such as atomic collision cross-sections for metal vapors and hyperfine electronic structure of the atomic absorption spectra are addressed. Film deposition thickness profiles and

atomic absorption spectra given by the DSMC method and experiment for pure yttrium evaporation are in excellent agreement. Interaction between the vapor jets is found to have a significant effect on the film growth rate and species molar ratio that are key factors of the film technology.
DTIC
Monte Carlo Method; Vapor Deposition; Direct Numerical Simulation; Superconducting Films; YBCO Superconductors

20020074881 Xerox Palo Alto Research Center, CA USA
A Frontal Attack on Limiting Defects in Nitrides: Theory and Computations ***Final Report, 1 May 2000-30 Jun. 2002***
Walle, Chris G. Van de; Northrup, John E.; Jun. 30, 2002; 105p; In English
Contract(s)/Grant(s): F49620-00-C-0019
Report No.(s): AD-A405148; AFRL-SR-AR-TR-02-0253; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Defects are limiting the performance of nitride semiconductor devices: they restrict doping levels, lead to device degradation, and interfere with achieving undoped or semi-insulating material. We have performed a comprehensive theoretical study aimed at facilitating the identification of defects and impurities, and at devising strategies for controlling their formation. Calculations were performed for isolated point defects, defect complexes, and impurities, in a bulk environment, as well as in the vicinity of extended defects and on the GaN surface. In addition to GaN, we performed calculations for InN and AlN, aimed at addressing InGaN and AlGaN alloys that are an essential constituent of device structures. Throughout, the computational results have been used for comparisons with and interpretations of experimental results. Significant results include the identification of a novel structure of Mg-H complexes; a critical assessment of the prospects of codoping; comprehensive results for diffusion of point defects and of hydrogen; a new model for the structure of screw dislocations; detailed values for the effects of impurities on the lattice parameters; the finding that hydrogen acts as a source of n-type conductivity in InN; and a comprehensive thermodynamic description of GaN surfaces in the presence of hydrogen.
DTIC
Point Defects; Solid State; Gallium Nitrides; N-Type Semiconductors; Doped Crystals

20020075012 Naval Research Lab., Washington, DC USA
Optical Characterization of Boron-doped Nano-Crystalline Diamond
Kalish, Rafi; Butler, James E.; Jul. 25, 2002; 16p; In English
Contract(s)/Grant(s): BAA-02-001; N0014-02-4028
Report No.(s): AD-A405197; NRL/MR/6170--02-8626; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The optical properties of nano-crystalline diamond films and their relation to the presence of boron is the topic of the study undertaken during Prof Kalish's recent short visit to the Naval Research Laboratory. One of the objectives of the present study was to quantify optical properties of CVI) diamond, and correlate them with B and other impurity contents in CVD diamond. To that end, a set of samples grown at NRL was subjected to Raman, PL, Optical and UV as well as IR measurements at NRL, and to SIMS measurements at the Technion.
DTIC
Diamond Films; Vapor Deposition

20020075022 Karlova Univ., Prague, Czechoslovakia
IR Detectors Technology ***Final Report, 10 Aug. 2000-7 Sep. 2001***
Hoeschl, Pavel; Jul. 2001; 53p; In English; Original contains color images
Contract(s)/Grant(s): F61775-00-WE064
Report No.(s): AD-A405171; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report results from a contract tasking Charles University as follows: The contractor will perform a series of in-situ Hall effect and conductivity measurements of CdTe/CdZnTe material to determine dependence of temperature above the melting point. A new setup for high temperature galvanomagnetic measurements enabling better control of the Cd overpressure above the melt will be constructed. Based on the experimental and theoretical results a model will be determined and defect concentrations in samples annealed under defined conditions will be further verified. Near perfect (CdZn)Te crystals of diameter up to 10 cm under a defined Cd overpressure will be prepared and evaluated.
DTIC
Conductivity; Cadmium Tellurides; Liquid Phase Epitaxy; Galvanomagnetic Effects; Hall Effect; Infrared Detectors

20020075970 Argonne National Lab., IL USA

Mesoscale modeling of grain boundary migration under stress using coupled finite element and meshfree methods.

Chen, J. -S.; Lu, H.; Moldovan, D.; Wolf, D.; May 24, 2002; 8p; In English

Report No.(s): DE2001-795811; ANL/MSD/CP-107772; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The process of grain boundary migration involves moving interfaces and topological changes of grain boundary geometry. This can not be effectively modeled by Lagrangian, Eulerian, or arbitrary Lagrangian Eulerian finite element formulation when stress effect is considered. A coupled finite element and meshfree approach is proposed for modeling of grain boundary migration under stress. In this formulation, the material grid carries material kinematic and kinetic variables, whereas the grain boundary grid carries grain boundary kinematic variables. The material domain is discretized by a reproducing kernel partition of unity with built-in strain discontinuity across the grain boundaries. The grain boundaries, on the other hand, are discretized by the standard finite elements. This approach allows an arbitrary evolution of grain boundaries without continuous remeshing.

NTIS

Grain Boundaries; Lagrangian Function; Computational Grids; Atmospheric Models; Grid Generation (Mathematics)

20020076008 Argonne National Lab., IL USA

Practical Superconductor Development for Electrical Power Applications *Annual Report, FY 2001*

Balachandran, U.; Cha, Y. S.; Dorris, S. E.; Dusek, J. T.; Emerson, J. E.; Apr. 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM

Report No.(s): DE2002-42874; ANL-02/03; No Copyright; Avail: National Technical Information Service (NTIS)

Most large-scale applications of high critical temperature superconductors will require wires or tapes that can carry large current in applied magnetic fields. This report describes research and development efforts at Argonne National Laboratory (ANL) aimed at producing practical superconducting components and devices using the Y-Ba-Cu-O and Bi-(Pb)-SR-Ca-Cu-O systems. Topics discussed include various methods of forming second- and first-generation composite conductors, characterization of their structures and superconducting and mechanical properties, modeling of grain-boundary current transport, and the testing and modeling of a superconducting fault current limiter.

NTIS

Superconductors (Materials); Electric Power; Research and Development

20020076015 Argonne National Lab., IL USA

Practical superconductor development for electrical power applications : annual report for FY 2001.

Cha, Y. S.; Dorris, S. E.; Dusek, J. T.; Emerson, J. E.; Erck, R. A.; May 02, 2002; 88p; In English

Report No.(s): DE2001-795893; ANL-02/03; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Most large-scale applications of high-critical-temperature superconductors will require wires or tapes that can carry large current in applied magnetic fields. This report describes research and development efforts at Argonne National Laboratory (ANL) aimed at producing practical superconducting components and devices using the Y-Ba-Cu-O and Bi-(Pb)-SR-Ca-Cu-O systems. Topics discussed include various methods of forming second- and first-generation composite conductors, characterization of their structures and superconducting and mechanical properties, modeling of grain-boundary current transport, and the testing and modeling of a superconducting fault current limiter.

NTIS

Magnetic Fields; Mechanical Properties; High Temperature Superconductors; YBCO Superconductors; Critical Temperature; Grain Boundaries

20020076088 California Univ., Lawrence Berkeley National Lab., Berkeley, CA USA

Investigation of Non-hydrogenated DLC:Si Prepared by Cathodic Arc

Monteiro, O. R.; Delplancke-Ogletree, M. P.; Mar. 2002; 24p; In English

Report No.(s): DE2002-795987; LBNL-49944; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Non-hydrogenated DLC films (also referred as ta-C) have been extensively studied and are used for a variety of wear related applications. Alloying DLC with refractory metals and other elements have been shown to be promising techniques to overcome some of the problems associated with pure DLC, such as excessive level of intrinsic stresses and high-temperature stability. The microstructure of DLC:Me in general consists of crystalline metal carbides dispersed in a DLC matrix. In contrary, DLC:Si has an amorphous structure. We have used filtered cathodic arc to prepare DLC:Si up to 6% Si, and have characterized their structure and bonding using microscopy (TEM) and spectroscopy (XPS, NEXAFS). The effect of Si in changing the bonding configuration

of the C network is discussed. The microstructure is then correlated to hardness and friction measured by nano-indentation and micro-wear.
NTIS
Amorphous Materials; Hydrogenation; Microstructure; Refractory Metals; Cathodes; Silicon Carbides

20020076173 Department of Energy, Office of Science and Technology, Washington, DC USA
Ordering Phenomena in Undercooled Alloys
Fultz, B.; Jul. 17, 1997; 9p; In English
Report No.(s): DE2001-762756; CERN/LHCC/98-36; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Much of the work performed under this grant was devoted to using modern ideas in kinetics to understand atom movements in metallic alloys far from thermodynamic equilibrium. Kinetics arguments were based explicitly on the vacancy mechanism for atom movements. The emphasis was on how individual atom movements are influenced by the local chemical environment of the moving atom, and how atom movements cause changes in the local chemical environments. The author formulated a kinetic master equation method to treat atom movements on a crystal lattice with a vacancy mechanism. Some of these analyses (3,10,16) are as detailed as any treatment of the statistical kinetics of atom movements in crystalline alloys. Three results came from this work. Chronologically they were (1) A recognition that tracking time dependencies is not necessarily the best way to study kinetic phenomena. If multiple order parameters can be measured in a material, the 'kinetic path' through the space spanned by these order parameters maybe just as informative about the chemical factors that affect atom movements (2,3,5-7,9-11,14-16, 18,19,21,23,24,26,36,37). (2) Kinetic paths need not follow the steepest gradient of the free energy function (this should be well-known), and for alloys far from equilibrium the free energy function can be almost useless in describing kinetic behavior. This is why the third result surprised me. (3) In cluster approximations with multiple order parameters, saddle points are common features of free energy functions. Interestingly, kinetic processes stall or change time scale when the kinetic path approaches a state at a saddle point in the free energy function, even though these states exist far from thermodynamic equilibrium. The author calls such a state a 'pseudostable' (falsely stable) state (6,21,26). I have also studied these phenomena by more 'exact' Monte Carlo simulations. The kinetic paths showed features similar to those found in analytical theories. The author found that a microstructure with interfaces arranged in space as a periodic minimal surface is a probably an alloy at a saddle point in its free energy function (21,26,37).
NTIS
Microstructure; Thermodynamic Equilibrium; Crystallinity; Free Energy; Monte Carlo Method; Supercooling

20020076256 MRJ Technology Solutions, Inc., Moffett Field, CA USA
Substrate Effects on Electronic Properties of Adatom Chains
Toshishige, Yamada, MRJ Technology Solutions, Inc., USA; [1998]; 2p; In English; 6th Foresight Conference, 12-15 Nov. 1998, Santa Clara, CA, USA
Contract(s)/Grant(s): NAS2-14303; RTOP 519-40-12; No Copyright; Avail: Issuing Activity; Abstract Only

About VI author/originator verification in form 1676: (1) There is no export controlled, confidential commercial information. (2) Regarding the patent, the technical field covered here is related to ARC-14246, 'Doping Method of Semiconducting Atomic Chains." Most results are covered by ARC-14246.
Derived from text
Adatoms; Substrates; Molecular Chains

20020076264 Lawrence Livermore National Lab., Livermore, CA USA
Quantum Simulations of Solids, Liquids and Nanostructures
Galli, Giulia, Lawrence Livermore National Lab., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 153-171; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This presentation covers computation as a tool for scientific investigation, including: Why ab-initio simulations? Some interdisciplinary problems where ab-initio simulations can have an impact; How the methods developed in the solid state physics community have evolved and where they have spread; How these methods 'join' quantum chemistry methods and how they are reaching out to the biology arena; Major limitations and challenges.
Derived from text
Quantum Chemistry; Computerized Simulation; Molecular Dynamics

20020076267 Brown Univ., Providence, RI USA

Scale-Bridging in Dislocation-Based Multi-Scale Modeling

Sim, Kyung-Suk, Brown Univ., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 223-240; In English; Also announced as 20020076258; Original contains color illustrations; Supported in part by Ford; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Three examples of scale bridging problems in nano- and micro-mechanics of solids will be discussed in this presentation: 1) Generalized stacking fault energy, dislocation-nucleation instability, and its effects on flow stress of the slip process; 2) Multiple-dislocation cooperative slip bridging dislocation nucleation processes and pile-up termination processes; 3) Continuum plastic-flow-field transition from small scale to a large scale, caused by elastic and plastic anisotropy incompatibilities. Plastic flow of crystalline solids is primarily governed by the motion of dislocations. The motion is controlled by various dislocation characteristics at different length scales. Therefore, the plastic flow and the failure processes led by plastic flow must be analyzed by multi-scale modeling, if responsible micro-mechanisms for an upper-scale phenomena are to be understood and interlinked between different length scales.

Derived from text

Nanostructure (Characteristics); Stacking Fault Energy; Nucleation; Plastic Anisotropy; Elastic Anisotropy; Plastic Flow; Computerized Simulation

20020076270 Argonne National Lab., Materials Science Div., IL USA

Multiscale Simulation of Grain Growth in Nanocrystalline Thin Films

Moldovan, Dorel, Argonne National Lab., USA; Wolf, Dieter, Argonne National Lab., USA; Phillpot, Simon R., Argonne National Lab., USA; Haslam, Andrew J., Argonne National Lab., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 299-330; In English; Also announced as 20020076258; Original contains color illustrations

Contract(s)/Grant(s): W-31-109-eng-38; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

We have combined molecular-dynamics simulations with mesoscopic simulations to study the mechanism and kinetics of grain growth in a thin film of nanocrystalline palladium with a columnar grain structure. The conventional picture is that grain growth results solely from the migration of grain boundaries in response to the driving force associated with the reduction in the grain-boundary area. However, our molecular dynamics simulations suggest that, at least in a nanocrystalline microstructure, grain rotations play an equally important role. Based on this insight we have developed a kinetic model for grain-boundary-diffusion accommodated grain rotation, extending the formalism of Raj and Ashby for grain-boundary sliding. We have incorporated this model into a mesoscopic-simulation code based on the Needleman-Rice variational formalism for the dissipated power. The presence of both grain-boundary migration and grain rotation introduces a physical length scale, Rc, into the system. The growth process is characterized by two regimes: if the average grain size is smaller than Rc, grain growth is grain-rotation dominated; by contrast, if the average grain size is greater than Rc, grain growth is dominated by grain-boundary migration. Our study reveals that the growth exponents characterizing the power-law time dependence of the average grain size are different for the two growth regimes. We discuss how this methodology can be extended to allow the study of deformation process. This combination of atomic-level with mesoscopic simulations then enables the investigation, in a physically realistic manner, of grain growth in systems containing a large number of grains and over long times.

Author

Molecular Dynamics; Palladium; Nanocrystals; Grain Boundaries; Microstructure

20020076271 Cornell Univ., Ithaca, NY USA

Anisotropic Materials Properties: Functional Forms for Multiscale Modeling

Bailey, Nicholas, Cornell Univ., USA; Cretegny, Thierry, Cornell Univ., USA; Rauscher, Markus, Cornell Univ., USA; Sethna, James, Cornell Univ., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 331-342; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This talk is about a particular aspect of the 'parameter passing' method of multiscale modeling, namely the mathematical representation of the parameters in question. Typically the information to be passed is more than a few numbers; it's functions of several variables: orientation, stress etc. From our experience in three different contexts we have abstracted an approach to designing functional forms which is rooted in basic physics principles. The examples are: (1) the stress dependence of Peierls

barriers of dislocations; (2) the orientation dependence of atomistically computed surface energies and (3) the orientation dependence of the etching rate of silicon by KOH.
Author
Anisotropy; Computerized Simulation; Dislocations (Materials); Etching; Orientation

20020076273 North Carolina State Univ., Raleigh, NC USA
Multiscale Modeling of Polycrystalline Materials
Shenderova, Olga, North Carolina State Univ., USA; Brenner, Donald, North Carolina State Univ., USA; Nazarov, Airat, Academy of Sciences (Russia), Russia; Romanov, Alexei, Academy of Sciences (Russia), Russia; Yang, Lin, Lawrence Livermore National Lab., USA; Multiscale Modeling, Simulation and Visualization and Their Potential for Future Aerospace Systems; July 2002, pp. 371-395; In English; Also announced as 20020076258; Original contains color illustrations; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

In the first part of this presentation, a combination of atomic-scale structural modeling, density functional calculations and mesoscale theory will be presented that yields predictions of the mechanical properties of polycrystalline materials. This is an example of hierarchical multiscale modeling in which results at one scale are used as input for methods appropriate at the next larger scale. This project is collaboration between Donald Brenner of North Carolina State University, Airat Nazarov and Alexei Romanov, of Russian Academy of Science, and Lin Yang of Lawrence Livermore National Laboratory. The Office of Naval Research provided support for this work. At the end of the presentation, a multiscale model of polymer nanocomposites which is another example of serial approach will be briefly outlined. The hierarchy of computational methods will include atomistic, mesoscopic and analytic levels. This work is a collaboration effort between Leonid Zhigilei, Dana Elzey and Ioannis Chasiotis of University of Virginia, Deepak SRivastava of NASA Ames Research Center and computational group of International Technology Center. Accurate first-principles predictions of macroscopic-scale materials properties strictly from theory remain a long-standing goal of the materials modeling community. Regarding polycrystalline materials, it would be beneficial to accurately predict properties of their grain boundaries (GBs), since it is well recognized that many of the properties of polycrystals depend to a large extent on the properties of their internal interfaces and their junctions. GBs contribute to strength, ductility, toughness, corrosion resistance as well as thermal and electronic properties. In our research we concentrated mostly on prediction of mechanical properties of polycrystalline diamond according to an interest of ONR, however the developed approach is quite general.
Author
Computerized Simulation; Scale (Ratio); Polycrystals; Nanocomposites; Carbon Nanotubes; Diamonds

20020076285 National Defence Research Establishment, Div. of Sensor Technology, Linkoeping, Sweden
Photon Bandgaps: A Research Survey ***Fotonbandgap: Inventering och Forskningsbevakning***
Ribbing, C. G.; Feb. 2000; 22p; In Swedish
Report No.(s): PB2002-107037; FOA-R-00-01432-18-SE; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The physical background to the appearance of photonic bands in periodic structures is summarized. The treatment closely follows the conventional literature about electronic band-structure in crystals. In the following section a short overview is given of the organization and purpose of the collaboration between the Defense Research Establishment and the University of Uppsala that is supported by the present contract with the Defense Materials Administration. A few internationally well-known research centra within this area of research are presented in the second chapter. Finally, two aspects of the activities just starting up: new epoxy for deep UV-litography and numerical photon band calculations, are discussed.
NTIS
Crystals; Electronic Structure; Epoxy Resins; Photons; Energy Gaps (Solid State)

20020076301 Prairie View Agricultural and Mechanical Coll., Center for Applied Radiation Research, TX USA
Radiation Exposure Effects and Shielding Analysis of Carbon Nanotube Materials ***Final Report, 1 Jul. - 31 Dec. 2001***
Wilkins, Richard, Prairie View Agricultural and Mechanical Coll., USA; August 2002; 42p; In English; Original contains color illustrations
Contract(s)/Grant(s): NAG9-1370
Report No.(s): PVAMU-410550; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Carbon nanotube materials promise to be the basis for a variety of emerging technologies with aerospace applications. Potential applications to human space flight include spacecraft shielding, hydrogen storage, structures and fixtures and nano-electronics. Appropriate risk analysis on the properties of nanotube materials is essential for future mission safety. Along

with other environmental hazards, materials used in space flight encounter a hostile radiation environment for all mission profiles, from low earth orbit to interplanetary space.
Author
Carbon Nanotubes; Spacecraft Shielding; Fixtures; Aerospace Engineering; Radiation Dosage

20020076367 National Inst. of Standards and Technology, Gaithersburg, MD USA
Workshop on Temperature Measurement of Semiconductor Wafers Using Thermocouples
Kreider, K. G.; DeWitt, D. P.; Tsai, B. K.; Jan. 05, 2001; 124p; In English
Report No.(s): PB2002-106709; NISTIR-6566; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

RTP'2000 is a conference for engineers, scientists, managers, and marketing specialists working in the thermal processing of semiconductors, manufacturing, simulation, and equipment development. The goal is to provide a comprehensive overview of current and future directions of thermal processing technology and processing systems. The primary emphasis is on the state-of-the-art tools, and on rapid thermal processing (RTP) and furnace concepts and methods as they apply to commercial Ultra Large Scale Integration (ULSI) processing.
NTIS
Temperature Measurement; Thermocouples; Wafers; Semiconductors (Materials)

20020076390 NASA Pasadena Office, CA USA
Method of Forming Three-Dimensional Semiconductors Structures
Fathauer, Robert W., Inventor, Jet Propulsion Lab., California Inst. of Tech., USA; May 14, 2002; 6p; In English
Patent Info.: Filed 18 May 1990; NASA-Case-NPO-17835; US-Patent-6,387,781; US-Patent-Appl-SN-524959; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Silicon and metal are coevaporated onto a silicon substrate in a molecular beam epitaxy system with a larger than stoichiometric amount of silicon so as to epitaxially grow columns of metal silicide embedded in a matrix of single crystal, epitaxially grown silicon. Higher substrate temperatures and lower deposition rates yield larger columns that are farther apart while more silicon produces smaller columns. Column shapes and locations are selected by seeding the substrate with metal silicide starting regions. A variety of 3-dimensional, exemplary electronic devices are disclosed.
Official Gazette of the U.S. Patent and Trademark Office
Molecular Beam Epitaxy; Substrates; Silicides

20020077663 NASA Glenn Research Center, Cleveland, OH USA
Method and Apparatus for Obtaining a Precision Thickness in Semiconductor and Other Wafers
Okojie, Robert S., Inventor, NASA Glenn Research Center, USA; Jul. 30, 2002; 9p; In English
Patent Info.: Filed 8 Sep. 2000; NASA-Case-LEW-17022-1; US-Patent-6,426,296; US-Patent-Appl-SN-657744; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A method and apparatus for processing a wafer comprising a material selected from an electrical semiconducting material and an electrical insulating material is presented. The wafer has opposed generally planar front and rear sides and a peripheral edge, wherein said wafer is pressed against a pad in the presence of a slurry to reduce its thickness. The thickness of the wafer is controlled by first forming a recess such as a dimple on the rear side of the wafer. A first electrical conducting strip extends from a first electrical connection means to the base surface of the recess to the second electrical connector. The first electrical conducting strip overlies the base surface of the recess. There is also a second electrical conductor with an electrical potential source between the first electrical connector and the second electrical connector to form. In combination with the first electrical conducting strip, the second electrical conductor forms a closed electrical circuit, and an electrical current flows through the closed electrical circuit. From the front side of the wafer the initial thickness of the wafer is reduced by lapping until the base surface of the recess is reached. The conductive strip is at least partially removed from the base surface to automatically stop the lapping procedure and thereby achieve the desired thickness.
Official Gazette of the U.S. Patent and Trademark Office
Insulation; Semiconductors (Materials); Wafers; Thickness

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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.

20020074365 Communications Research Lab., Japan
Continuous Variable Teleportation of Nonclassical States in Noisy Environment
Takeoka, Masahiro, Communications Research Lab., Japan; Ban, Masashi, Communications Research Lab., Japan; Sasaki, Masahide, Communications Research Lab., Japan; Review of the Communciations Research Laboratory; March 2002; ISSN 0914-9279; Volume 48, No. 1, pp. 113-121; In Japanese; Copyright; Avail: Issuing Activity

Transmission of nonclassical quantum states by quantum teleportation of continuous variables is studied. Protocol of quantum teleportation via a two-mode squeezed-vacuum state in a noisy environment is formulated by the Glauber-Sudarshan P-function. Using the nonclassical depth as an estimation parameter of transmission performance, we compare the teleportation scheme with the direct transmission through a noisy channel. The noise model is based on the coupling to the vacuum field. We find that the teleportation channel has better transmission performance than the direct transmission channel in a certain region. The bounds for such region and for obtaining the nonvanished nonclassicality of the teleported quantum states are also discussed. We also mention the required conditions for transmitting nonclassical features in real experiments.
Author
Quantum Theory; Quantum Statistics; Models

20020075676 Argonne National Lab., IL USA
Irradiation of structure material in spallation neutron sources.
Naberejnev, D. G.; Salvatores, M.; Feb. 18, 2002; 3p; In English
Report No.(s): DE2001-795825; ANL/TD/CP-106920; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In principle, intense spallation neutron sources can be used not only to irradiate materials (e.g. window materials) and to validate different target geometries/concepts, but also to irradiate structural materials (samples, pins or even full assemblies) in order to characterize their behavior under irradiation (in a fast neutron field). However, a question arises concerning the 'representativity' of such irradiations to reproduce the conditions encountered in a typical fast reactor. The present paper documents an investigation aimed at understanding phenomena related to the representativity of an irradiation using an intense spallation source, with regards to neutron damage and Helium production. Two different designs of a spallation neutron source are considered. The first is an Intense Spallation Neutron Source (ISNS) proposed at CEA, France as a potential irradiation tool. The second is one of the current models for the TMT (Target for Material Testing) of the ADTF (Accelerator Driven Test Facility) program. In our calculations we used the MCNPX Version 2.1.5 Monte Carlo code.
NTIS
Fast Neutrons; Neutron Sources; Spallation; Irradiation; Fast Nuclear Reactors

20020076000 Fermi National Accelerator Lab., Batavia, IL USA
CDF-II time-of-flight detector
Cabera, S.; Jul. 01, 2002; 18p; In English
Report No.(s): DE2001-795922; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A Time-of-Flight (TOF) detector, based on plastic scintillator and fine-mesh photomultiplier tubes, has been added to the CDF-II experiment. Since August 2001, the TOF system has been fully instrumented and integrated into the CDF-II data acquisition system. The TOF system will provide particle identification of low momentum charged pions, kaons and protons in -collisions. With a design resolution goal of about 100 ps, separation between charged kaons and pions is expected at the 2 sigma level for momenta below 1.6 GeV/c, which enhances CDF's b-flavor tagging capabilities. They describe the design of the TOF detector and discuss its on-line and off-line calibration. Some performance benchmarks using proton-antiproton collision data are presented.
NTIS
Design; Kaons; Proton-Antiproton Interactions; Particle Collisions; Data Acquisition; Calibrating

20020076002 Fermi National Accelerator Lab., Batavia, IL USA
Antiproton acceleration in the Main Injector with RF at harmonic number h=28 or h=84
MacLachlan, J. A.; Jul. 01, 2002; 6p; In English

Report No.(s): DE2001-795913; FERMILAB-TM-2177; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Antiproton bunches of 1.5 eVs are required for the Tevatron but can not be accelerated through transition in the Main Injector (MI) with the h=588 rf system. Chandra Bhat has developed parameters for h=28 acceleration from 8 GeV followed by h=588 acceleration from 25 to 150 GeV.(1) This note refines the h=28 scenario and also adapts it to the h=84 case needed for 132 ns separation. It is practicable to accelerate the 1.5 eVs (bar p) bunches in about seven seconds with no loss and less than ten percent emittance growth using the existing 2.5 MHz cavities. Both the cycle time and emittance growth are significantly improved by the scheme described in this note. Excellent results can be obtained for the 7.5 MHz case with only 75 kV except that there is a 0.5 % beam loss. For completely clean 53 MHz capture of the tail produced by shape mismatch at transition, 250 kV is desirable for bunch rotation at 26 GeV.

NTIS

Acceleration; Antiprotons; Cavities; Particle Accelerators; Enhanced Vision

20020076080 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA

Application of ual to high intensity beam dynamics studies in the sns accumulator ring.

Malitsky,; Fedotov, V.; Wei,; Jun. 03, 2002; 3p; In English

Report No.(s): DE2001-797138; BNL--69271; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The SNS Ring off-line parallel simulation environment based on the Unified Accelerator Libraries (UAL) has been implemented and used for extensive full-scale beam dynamics studies arising in high-intensity rings. The paper describes the structure of this environment and its application to the development and analysis of the SNS accumulator ring beam loss model including a complex combination of several physical effects.

NTIS

Accelerators; Accumulators; Beam Interactions

20020076119 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA

Large aperture narrow quadroupole for the sns accumulator ring.

Tsoupas,; Brodowski,; Meng,; Wei,; Lee, Y.; Jun. 03, 2002; 3p; In English

Report No.(s): DE2001-797133; BNL--69024; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The accumulator ring of the Spallation Neutron Source (SNS) is designed to accept high-intensity H(sup -) beam of 1 GeV kinetic energy from the injecting LINAC, and to accumulate, in a time interval of 1 msec, 2 x 10(sup 14) protons in a single bunch of 700 nsec. In order to optimize the effective straight-section spaces for beam-injection, extraction and collimation, we have minimized the width of the large aperture quadrupoles which are located in the same straight sections of the accumulator ring with the injection and extraction systems. by minimizing the width of the quadrupoles to (+-)40.4 cm, the beam-injection and extraction angles are lowered to 8.75(sup o) and 16.8(sup o) respectively. Further optimization of the narrow quadrupole, minimizes the strength of the dodecapole multipole component of the quadrupole, thus reducing the width of the 12pole structure resonance and allowing a larger tune space for stability of the circulating beam. In this paper we present results derived from magnetic field calculations of 2D and 3D modeling, and discuss the method of optimizing the size of the quadrupole and minimizing its dodecapole multipole component.

NTIS

Quadrupoles; Neutron Sources; Linear Accelerators

20020076185 Fermi National Accelerator Lab., Batavia, IL USA

Tevatron Run II performance and plans

Church, M. D.; Jul. 12, 2002; 4p; In English

Report No.(s): DE2001-796951; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Fermilab accelerator complex has been operating Run II for approximately one year. In this mode 36 proton bunches collide with 36 antiproton bunches at 2 interaction regions in the Tevatron at 980 GeV beam energy. The long range goal in Run II is to obtain a total integrated luminosity of 15 pb(sup -1). The current status and performance of the accelerator complex is described, including the Tevatron, Main Injector, Antiproton Source, and Recycler Ring. Future upgrade plans and prospects for reaching the admittedly ambitious long range goal are presented.

NTIS

Particle Accelerators; Protons; Injectors

20020076186 Fermi National Accelerator Lab., Batavia, IL USA
QCD results from the Tevatron
Mesropian, C.; Jul. 12, 2002; 6p; In English
Report No.(s): DE2001-796949; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Tevatron hadron collider provides the unique opportunity to study Quantum Chromodynamics, QCD, at the highest energies. The results summarized in this talk, although representing different experimental objects, as hadronic jets and electromagnetic clusters, serve to determine the fundamental input ingredients of QCD as well as to search for new physics. The authors present results from QCD studies at the Tevatron from Run 1 data, including jet and direct photon production, and a measurement of the strong coupling constant.
NTIS
Quantum Chromodynamics; Particle Accelerators

20020076188 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Hadron Structure: the fundamental physics to Access via GPDs
Radyushkin, A.; Apr. 01, 2002; 11p; In English
Report No.(s): DE2001-796876; JLAB-THY-02-27; DOE/ER/40150-2113; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

An introductory review of generalized parton distributions (GPDs) is given. The structure of hadrons is the fundamental physics to be accessed via GPDs. GPDs describe hadronic structure on the quark-gluon level and provide a 3-dimensional picture ('tomography') of hadronic structure. GPDs adequately reflect the quantum-field nature of QCD (correlations, interference). They also provide new insights into spin structure of hadrons (spin-flip distributions, orbital angular momentum). GPDs are sensitive to chiral symmetry breaking effects, a fundamental property of QCD. Furthermore, GPDs unify existing ways of describing hadronic structure. The GPD formalism provides nontrivial relations between different exclusive reactions and also between exclusive and inclusive processes.
NTIS
Hadrons; Chirality; Broken Symmetry; Angular Momentum

20020076190 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
Deep Inelastic Scattering from Light Nuclei
Melnitchouk, W.; Thomas, A. W.; Apr. 01, 2002; 10p; In English
Report No.(s): DE2001-797084; JLAB-THY-02-28; DOE/ER/40150-2116; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

We review recent developments in the study of deep inelastic scattering from light nuclei, focusing in particular on deuterium, helium, and lithium nuclei. Understanding the nuclear effects in these systems is essential for the extraction of information on the neutron structure function.
NTIS
Inelastic Scattering; Laser Outputs; Extraction; Focusing

20020076191 Fermi National Accelerator Lab., Batavia, IL USA
IV and CV curves for irradiated prototype BTeV silicon pixel sensors
Coluccia, M. R.; Jul. 16, 2002; 6p; In English
Report No.(s): DE2001-797075; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The authors present IV and CV curves for irradiated prototype n(sup +)/n/p(sup +) silicon pixel sensors, intended for use in the BTeV experiment at Fermilab. They tested pixel sensors from various vendors and with two pixel isolation layouts: p-stop and p-spray. Results are based on exposure with 200 MeV protons up to 6 x 10(sup 14) protons/cm(sup 2).
NTIS
Irradiation; Silicon; Exposure

20020076209 Thomas Jefferson National Accelerator Facility, Newport News, VA USA
CDEV-NT: Porting the Control Device Interface to Windows NT
Akers, W.; Chen, J.; Watson, C.; Oct. 01, 1999; 3p; In English
Report No.(s): DE2001-797085; JLAB-ACE-99-12; DOE/ER/40150-2117; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

In recent years the rapid increase in processing power of the personal computer has made it a significant competitor to high-end workstations for accelerator control and experimental physics applications. When the decreasing price of the PC and the availability of inexpensive commercial software is also considered, NT becomes a very attractive alternative to traditional UNIX systems. In order to simplify the integration of Personal Computers into our operating environment, we have ported the Control Device (CDEV) Interface to Windows NT. by supporting CDEV on this platform, we can provide routine access to our existing control system. Additionally, CDEV allows us to create an interface from our UNIX workstations to Windows NT applications (such as databases) that are significantly less expensive on the PC. This paper details the pitfalls we encountered during the software migration and will provide a direct comparison between the performance of CDEV applications on UNIX and NT. P articular attention is paid to network performance, which represents most of the overhead of this transition.
NTIS
Accelerators; Control Equipment; Data Bases; Control

20020076210 Fermi National Accelerator Lab., Batavia, IL USA
F(1) for B (forward) D*ln from lattice QCD
Mackenzie, P. B.; Simone, J. N.; Jul. 12, 2002; 5p; In English
Report No.(s): DE2001-796967; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The authors would like to determine (vertical line)V(sub cb)(vertical line) from the exclusive semi-leptonic decay B(yields)D(star)lv. The differential decay rate is d(Lambda)/dw = G(sub F)(sup 2)/4(pi)(sup 3)(w(sup 2)-1)(sup 1/2)m(sub D*)(sup 3) (m(sub B)-m(sub D(star)))(sup 2)G(w)(vertical line)V(sub cb)(vertical line)(sup 2)(vertical line)F(subB(yields) D(star))(w)(vertical line)(sup 2), where w = v (center(underline)dot) v(prime) and G(1) = 1. At zero recoil (w = 1) heavy-quark symmetry requires F(sub B(yields)D(star))(1) to be close to 1. So, (vertical line)V(sub cb)(vertical line) is determined by dividingmeasurements of d(Lambda)/dw by the phase space and well-known factors, and extrapolating to w (yields) 1. This yields (vertical line)V(sub cb)(vertical line)F(sub B(yields)D(star))(1), and F(sub B(yields)D(star))(1) is taken from 'theory'. to date models (1) or a combination of a rigorous inequality plus judgement (2) have been used to estimate F(sub B(yields)D(star))(1) - 1. In this work (3) they calculate F(sub B(yields)D(star))(1) with lattice gauge theory, in the so-called quenched approximation, but the uncertainty from quenching is included in the error budget.
NTIS
Quantum Chromodynamics; Quarks; Inequalities; Gauge Theory

20020076223 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Sns extraction kicker system and first article bpfn test.
Mi,; Pai,; Davino,; Hahn,; Jun. 03, 2002; 4p; In English
Report No.(s): DE2001-797132; BNL--68927; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

The Spallation Neutron Source (SNS) extraction kicker system brings the proton beam from the accumulator ring through a beam transfer line into the target area. The 14 kicker magnets are located in one straight section. The kicker magnets are energized by 14 Blumlein type Pulse Forming Networks (BPFN). The first article of the SNS extraction kicker BPFN was assembled and tested at this laboratory. This paper describes the kicker BPFN system arrangement and parameters. The first article BPFN design and its main components used are explained. High voltage BPFN test results and the load current waveform are illustrated in this paper. Temperature measurements of the kicker ferrite blocks at full power showed only small or no heating. This paper discusses the modifications to the BPFN design, such as a saturating inductor and 25 Q termination, to minimize the transverse coupling impedance.
NTIS
Accelerators; Proton Beams; Magnets; Loads (Forces); High Voltages; Accumulators; Extraction

20020076225 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
High level rf for the sns ring.
Zaltsman,; Blaskiewicz,; Brennan,; Brodowski,; Meth,; Jun. 03, 2002; 3p; In English
Report No.(s): DE2001-797130; BNL--68909; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

A high level RF system (HLRF) consisting of power amplifiers (PA's) and ferrite loaded cavities is being designed and built by Brookhaven National Laboratory (BNL) for the Spallation Neutron Source (SNS) project. It is a fixed frequency, two harmonic system whose main function is to maintain a gap for the kicker rise time. Three cavities running at the fundamental harmonic (h=l) will provide 40 kV and one cavity at the second harmonic (h=2) will provide 20 kV. Each cavity has two gaps with a design voltage of 10 kV per gap and will be driven by a power amplifier (PA) directly adjacent to it. The PA uses a 600kW tetrode to provide the necessary drive current. The anode of the tetrode is magnetically coupled to the downstream cell of the cavity. Drive to the

PA will be provided by a wide band, solid state amplifier located remotely. A dynamic tuning scheme will be implemented to help compensate for the effect of beam loading.
NTIS
Radio Frequencies; Electric Potential; Broadband

20020076226 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Spallation neutron source project - physical challenges.
Wei,; Jun. 03, 2002; 3p; In English
Report No.(s): DE2001-797128; BNL--68907; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Spallation Neutron Source (SNS) is designed to reach an average proton beam power of 1.4 MW for pulsed neutron production. This paper summarizes design aspects and physical challenges to the project.
NTIS
Spallation; Neutron Sources

20020076227 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Half integer resonance crossing and space charge limit.
Fedotov, V.; Hofman,; Jun. 03, 2002; 3p; In English
Report No.(s): DE2001-797127; BNL--68905; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
We study the influence of space charge on the crossing of the second-order resonance and the associated space-charge limit in high-intensity rings. Two-dimensional simulation studies are compared and found to agree with the envelope models in the finding of an increased intensity limit due to the coherent frequency shift. We also discuss application of this effect to bunched beams and multi-turn injection painting, and the effect of high-order resonances and issues of the envelope instability.
NTIS
Space Charge; Two Dimensional Models; Frequency Shift; Injection

20020076228 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Bpm system for the sns ring and transfer lines.
Dawson, C.; Cameron,; Cerniglia,; Cupolo,; Degen,; May 06, 2002; 8p; In English
Report No.(s): DE2001-797124; BNL--69259; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
The Spallation Neutron Source Ring accumulates about 1060 pulses of 38mA peak current IGeV H-minus particles from the Linac thru the HEBT line, then delivers this accumulated beam in a single pulse to the mercury target via the RTBT line. Bunching frequency of beam in the HEBT line is 402.5MHz, and about 1MHz in the Ring and RTBT. Position monitor electrodes in HEBT are of the shorted stripline type, with apertures of 12cm except in the dispersive bend, where the aperture is 21cm. Ring and RTBT electrodes are open striplines, with apertures of 21, 26, 30, and 36cm. All pickups are dual plane. The electronics will be PC-based with the Analog/Digital Front End passing data and receiving control and timing thru a custom PC1 interface developed by LANL(l). LabVIEW will be used to direct the acquisition, process the data, and transfer results via Ethernet to the EPICS control system. to handle the dynamic range required with well over 60dB variation in signal size, the Ring and RTBT electronics will employ a fast gain switching technique that will take advantage of the 300ns tail-to-head gap to provide position measurement during the entire accumulation cycle. Beam-based alignment will be utilized as part of the system calibration.
NTIS
Neutron Sources; Alignment; Data Processing; Dynamic Range; Accumulations

20020076231 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Collective effects and their control at the spallation neutron source ring.
Wei,; Blaskiewicz,; Brodowski,; Cameron,; Davino,; Jun. 03, 2002; 3p; In English
Report No.(s): DE2001-797136; BNL--68906; No Copyright; Avail: Department of Energy Information Bridge, Microfiche
One of the primary tasks in the design of the Spallation Neutron Source (SNS) ring is to control collective effects including space charge, transverse and longitudinal instabilities, and electron cloud. Transverse painting is used to alleviate space charge force; longitudinal painting along with chromatic sextupoles are used to enhance Landau damping; injection kicker vacuum pipes are carefully shielded, and extraction kicker impedances are measured in detail and optimized; beam halo, beam loss and electron production are minimized; finally, damping systems at various frequencies are planned. This paper summarizes these design implementations.
NTIS
Landau Damping; Spallation; Electron Clouds; Stability

20020076232 Brookhaven National Lab., Riken BNL Research Center, Upton, NY USA
Assessment of a particle bed based beam stop.
Simos,; Ludewig,; Montanez,; Todosow,; Jun. 03, 2002; 3p; In English
Report No.(s): DE2001-797135; BNL--69055; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Accelerator target/beam stop concepts able to withstand the thermal shock induced by intense, undiluted beams are being assessed in this study. Such conditions normally push target materials beyond their limits leading to limited useful life. A number of ingenious options have been attempted to help reduce the level of stress generated. Attention is paid to a very promising option that calls for a target consisting of a cooled particle bed. In such configuration the ability of the particle bed structure to diffuse and attenuate the generated thermal shock waves is being explored by performing comprehensive dynamic analyses that incorporate anticipated energy depositions, thermal diffusion, and wave propagation and attenuation. Further, options of coolant liquid filling the porous structure of the particle bed, including concerns of pressure drop and heat transfer, are evaluated for maximizing particle yield.
NTIS
Accelerators; Thermal Shock; Diffusion Waves; Particle Beams; Drop Transfer

80
SOCIAL AND INFORMATION SCIENCES (GENERAL)

Includes general research topics related to sociology; educational programs and curricula.

20020074981 Embry-Riddle Aeronautical Univ., Daytona Beach, FL USA
The Relationship Between Fidelity and Learning in Aviation Training and Assessment
Noble, Cliff, Embry-Riddle Aeronautical Univ., USA; Journal of Air Transportation World Wide; 2002; ISSN 1093-8826; Volume 7, Nos. 2-3, pp. 33-54; In English; Copyright; Avail: Issuing Activity

Flight simulators can be designed to train pilots or assess their flight performance. Low-Fidelity simulators maximize the initial learning rate of novice pilots and minimize initial costs; whereas, expensive, high-fidelity simulators predict the realworld in-flight performance of expert pilots (Fink & Shriver, 1978 Hays & Singer 1989; Kinkade & Wheaton. 1972). Although intuitively appealing and intellectually convenient to generalize concepts of learning and assessment, what holds true for the role of fidelity in assessment may not always hold true for learning, and vice versa. to bring clarity to this issue, the author distinguishes the role of fidelity in learning from its role in assessment as a function of skill level by applying the hypothesis of Alessi (1988) and reviewing the Laughery, Ditzian, and Houtman (1982) study on simulator validity. Alessi hypothesized that there is it point beyond which one additional unit of flight-simulator fidelity results in a diminished rate of learning. The author of this current paper also suggests the existence of an optimal point beyond which one additional unit of flight-simulator fidelity results in a diminished rate of practical assessment of nonexpert pilot performance.
Author
Flight Simulators; Education; Aeronautics; Computerized Simulation

20020076377 National Center for Education Statistics, Washington, DC USA
Teaching with Technology: Use of Telecommunications Technology by Postsecondary Instructional Faculty and Staff in Fall 1998. Statistical Analysis Report
Warburton, E. C.; Chen, X.; Bradburn, E. M.; Zimbler, L. J.; Jul. 2002; 90p; In English
Report No.(s): PB2002-109032; NCES-2002-161; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report examines postsecondary instructional faculty and staff's access to and use of electronic mail (e-mail) and the Internet. Though these telecommunications technologies are rapidly becoming core components of the instructional experience of students in the USA, little descriptive information exists at the national level to address basic questions about technology use and teaching in postsecondary education. The purpose of this study is to respond to this need by answering the following questions: who has access to telecommunications technologies (in particular, the Internet); how much and in what ways do they use these technologies for instructional purposes, and how does technology use relate to workload and contact with students. The findings of this report are based on a nationally representative sample of instructional faculty and staff who taught one or more classes for credit in fall 1998.
NTIS
Computer Assisted Instruction; Telecommunication; Education

81
ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20020074901 Judge Advocate General's School, Charlottesville, VA USA
The Sounds of Silence: Promoting Alternative Dispute Resolution in Air Force Procurement by Putting Confidence into Confidentiality
Hartsell, John E.; Jan. 2001; 64p; In English
Report No.(s): AD-A405060; CI02-151; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Litigation can be expensive, inefficient, acrimonious, and there is always the chance you will lose; on the other hand, alternative dispute resolution (ADR) can be inexpensive, efficient, and there is always the chance you could end up worse off than if you'd chosen to litigate. Remarkably, both litigation and ADR, its fashionable alternative,3 are risky, but they are risky for entirely different reasons. The ultimate risk in litigation is the risk of losing. In ADR, the ultimate risk concerns confidentiality or lack thereof in negotiations.

DTIC
Legal Liability; Procurement; Defense Program

20020075042 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA
Motion Imagery's Effect on Air Force Commanders' Decision-Marketing Process: A Phenomenological Perspective
Higgins, Sandra L.; Aug. 14, 2002; 55p; In English
Report No.(s): AD-A405082; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This inquiry focuses on Air Force commanders' personal experiences with motion imagery when used as a tool in the decision-making process. It adopts a grounded theory approach to analyze emergent themes from the commanders' phenomenological perspectives. Strauss and Corbin's methodology of open, axial, and selective coding was used to analyze semi-structured interviews and senior leaders' videotaped interviews. The results indicated a substantive level theory based on Boyd's OODA (observe, orient, decide, act) loop in military decision-making. I label this emerging theory as Clear Canopy: Motion imagery use expedites the OODA loop in the first phase, approves/disproves mental images commanders might have in the orientation stage, validates/challenges pending decisions if more imagery is obtained, and provides feedback after action is completed.

DTIC
Decision Making; Phenomenology; Imagery; Motion Perception; Defense Program

20020075726 Idaho National Engineering and Environmental Lab., Idaho Falls, ID USA
Using Decision Analysis in Evaluation and Prioritization of Technologies for Long Term Stewardship
Nadeau, J.; Byers, J.; Harbour, J.; Hill, S.; Nickelson, R.; 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-797771; No Copyright; Avail: National Technical Information Service (NTIS)

The purpose of this paper is to describe a systematic approach to assess and prioritize technology concepts and systems for future research and development (R and D) funding. This paper discusses the analysis and rationale used in developing an evaluation process to assist those engaged in prioritizing technologies. This paper will explain the developed evaluation process, discuss the methodology, and summarize the rationale underlying the process.

NTIS
Research and Development; Decision Making; Decision Theory

20020076108 Federal Committee on Statistical Methodology, Statistical Policy Office, Washington , DC USA
Measuring and Reporting Sources of Errors in Surveys
Jun. 2001; 158p; In English
Report No.(s): PB2001-104329; STATISTICAL POLICY-WP-31; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

In 1996, the Federal Committee on Statistical Methodology (FCSM) established a subcommittee to review the measurement and reporting of data quality in federal data collection programs. Many issues revolve around these two broad topics, not the least of which is what is meant by quality. Different data users have different goals and, consequently, different ideas of what constitutes quality. If defining quality is difficult, then the reporting of quality is also. Reporting quality is dependent on the needs of data users and the kind of productanalytic report, technical report or data set, for example, made available to the user. The FCSM subcommittee, whose membership represents the experiences of 12 statistical agencies, took the approach of studying data quality

in terms of the measurement and reporting of various error sources that affect data quality: sampling error, nonresponse error, coverage error, measurement error, and processing error.
NTIS
Statistical Analysis; Error Analysis; Reports; Surveys

20020076161 General Accounting Office, Washington, DC USA
Nonproliferation R and D: NNSA's Program Develops Successful Technologies, but Project Management Can Be Strengthened
Aug. 2002; 36p
Report No.(s): PB2002-108887; GAO-02-904; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This report examines the (1) funding the program received over the past 5 years and the programs distribution of this funding to the national laboratories and, for fiscal year 2002, throughout its three research areas; (2) extent to which the program identifies users needs and monitors project progress; and (3) views of federal, state, and local agencies of the usefulness of program-developed technology, particularly in light of heightened homeland security concerns following September 11, 2001.
NTIS
Research and Development; Project Management; Nuclear Weapons; Security

20020076170 Santa Fe Inst., NM USA
A Broad Research Project in the Sciences of Complexity ***Final Report***
Lising, L. J.; Feb. 01, 2000; 22p; In English
Report No.(s): DE2001-761435; LBNL--43439; No Copyright; Avail: Department of Energy Information Bridge
Previous DOE support for 'A Broad Research Program in the Sciences of Complexity'; permitted the Santa Fe Institute to initiate new collaborative research within its Integrative Core activities as well as to host visitors to participate in research on specific topics that serve as motivation and testing-ground for the study of general principles of complex systems. The critical aspect of this support is its effectiveness in seeding new areas of research. Indeed, this Integrative Core has been the birthplace of dozens of projects that later became more specifically focused and then won direct grant support independent of the core grants. But at early stages most of this multidisciplinary research was unable to win grant support as individual projects--both because it did not match well with existing grant program guidelines, and because the amount of handing needed was often too modest to justify a formal proposal to an agency. In fact, one of the attributes of core support has been that it permitted SFI to encourage high-risk activities because the cost was quite low. What is significant is how many of those initial efforts have been productive in the SFI environment. Many of SFI'S current research foci began with a short visit from a researcher new to the SFI community, or as small working groups that brought together carefully selected experts from a variety of fields. As mentioned above, many of the ensuing research projects are now being supported by other funding agencies or private foundations. Some of these successes are described.
NTIS
Complex Systems; Multidisciplinary Research; Systems Engineering; Research Projects

20020076214 Cogent Software, Inc., Pasadena, CA USA
Internet Business Solutions
Spinoff 1997; 1997, pp. 103; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.
Cogent Software, Inc. was formed in January 1995 by David Atkinson and Irene Woerner, both former employees of the Jet Propulsion Laboratory (JPL). Several other Cogent employees also worked at JPL. Atkinson headed JPL's Information Systems Technology section and Woerner lead the Advanced User Interfaces Group. Cogent's mission is to help companies organize and manage their online content by developing advanced software for the next generation of online directories and information catalogs. The company offers a complete range of Internet solutions, including Internet access, Web site design, local and wide-area networks, and custom software for online commerce applications. Cogent also offers DesignSphere Online, an electronic community for the communications arts industry. Customers range from small offices to manufacturers with thousands of employees, including Chemi-Con, one of the largest manufacturers of capacitors in the world.
Author
Applications Programs (Computers); Directories; Information Systems; Internets; Local Area Networks; Wide Area Networks

20020076240 General Accounting Office, Washington, DC USA

Contract Management: Interagency Contract Program Fees Need More Oversight

Jul. 2002; 74p

Report No.(s): PB2002-108886; GAO-02-734; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Federal agencies are increasingly using contracts and acquisition services offered by other agencies and paying a fee for these services. These interagency contract service programs are being used in a wide variety of situations, from those in which a single agency provides limited contracting assistance to a soup to nuts approach in which the provider agencys contracting officer handles all aspects of the procurement. This increased use of interagency contracts has come about as a result of reforms and legislation passed in the 1990s, which allowed agencies to streamline the acquisition process, operate more like businesses, and offer increasing types of services to other agencies. Reliable information on the fees charged and revenues generated by interagency contract services can be helpful to the Congress and to federal executives when they make decisions about allocating federal resources, authorizing and modifying programs, and evaluating program performance.

NTIS

Contract Management; Management Planning; Costs

20020076241 General Accounting Office, Washington, DC USA

International Trade: Federal Action Needed to Help Small Businesses Address Foreign Patent Challenges

Jul. 2002; 130p

Report No.(s): PB2002-108882; GAO-02-789; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Small and start-up businesses are principal sources of innovation and therefore play an important role in technological development. These firms are also vital to U.S. economic growth--statistics show that small businesses created more than 5.5 million new U.S. jobs during the 1990s. In order to prosper, small businesses, particularly those in high-technology industries, must be able to protect and profit from the innovations that flow from their research and development expenditures. In the current global economy, protecting innovations in the USA and abroad is an increasingly important component of small businesses ability to develop markets in other countries. One way to globally protect innovations is to obtain U.S. and foreign patents. While small businesses held about 11 percent of the U.S. patents granted to U.S. entities in 2000, available research indicates that small businesses are less likely than large businesses to seek patents overseas, even when their inventions are of similar value.

NTIS

International Trade; Patents; Industries; Inventions

20020076345 Joint Financial Management Improvement Program, Washington, DC USA

Core Financial Systems Requirements

Nov. 2001; 108p; In English

Report No.(s): PB2002-108903; JFMIP-SR-02-01; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The citizens of the USA entrust the stewardship of Federal Government financial resources and assets to the legislative and executive branches of Government. Financial and program managers are accountable for program results and fiscally responsible for the resources entrusted to them. Managers must understand that their daily actions have financial implications for taxpayers and affect the amount of public debt the Federal Government must assume to support Government initiatives. Furthermore, managers must be able to provide information essential to monitor budgets, operations, and program performance. The Federal Government recognizes the importance of having high quality financial systems to support improvement of Government operations and to provide financial and related information to program and financial managers. The CFO Act of 1990, the GPRA, the Government Management Reform Act (GMRA) of 1994, and FFMIA of 1996 mandate improved financial management, assign clearer responsibility for leadership to senior officials, and require new financial organizations, enhanced financial systems, and audited financial reporting.

NTIS

Financial Management; Governments; Project Management

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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.

20020074561 RAND Corp., Santa Monica, CA USA
Linking Effectively: Learning Lessons from Successful Collaboration in Science and Technology
Wagner, Caroline S.; Staheli, Linda; Silberglitt, Richard; Wong, Anny; Kadtke, James; Apr. 2002; 60p; In English
Report No.(s): AD-A404931; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This briefing seeks to answer three questions: (1) Why study the subject of tonal, government-sponsored collaboration?; (2) What did we learn from the four case studies that gave an in-depth look at the U.S. experience in sponsoring and participating in these programs?, and (3) Can these programs be evaluated and are they worth the extra effort that is required to initiate and sponsor them? This briefing is organized to answer these questions, as well as to raise points of discussion and debate among those interested in this subject. It is presented in a format that draws lessons from the case studies and then presents key questions that emerged from the cases that can serve as a guide to others seeking to formulate similar collaborative programs. The first section discusses the growing role that international collaboration is playing in science and technology (S&T). Here we also discuss the case study methodology used for this study. The second section presents a framework of lessons learned that emerged from our examination of cases of successful collaboration. RAND created this framework as a tool to help policymakers create effective linkages in the future. The third section discusses, from the U.S. perspective, what people reported to us as some of the benefits of participating in international collaborations. The briefing has two components: a set of slides and a written accompaniment. The two parts are designed to be used together and read as a report, and it can also serve as the basis for a workshop. Agency officials seeking to explore the creation of formal international collaborations may wish to use this briefing to generate discussion and comment among colleagues and potential collaborators.
DTIC
Technology Transfer; International Relations; Research and Development

20020074582 General Accounting Office, Washington, DC USA
Critical Infrastructure Protection: Significant Challenges Need to Be Addressed
Dacey, Robert F.; Jul. 24, 2002; 65p; In English; Original contains color images; Testimony before the Subcommittee on Government Efficiency, Financial Management and Intergovernmental Relations, Committee on Government Reform, House of Representatives
Report No.(s): AD-A404848; GAO-02-961T; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The explosion in computer interconnectivity, while providing great benefits, also poses enormous risks. Terrorists or hostile foreign states could launch computer-based attacks on critical systems to severely damage or disrupt national defense or other critical operations. Presidential Decision Directive (33 and Executive Order 13231, issued in 1998 and 2001, respectively, call for various actions to improve our nation's critical infrastructure protection (CIP) , including establishing partnerships between the government and the private sector. CIP involves activities that enhance the security of our nation's cyber and physical public and private infrastructure that are essential to national security, national economic security, and/or national public health and safety. The President's national strategy for homeland security, issued last week, identifies protecting critical infrastructures and intelligence and warning, a critical CIP component, as two of six mission areas and expands our nation's approach to cover additional sectors of our economy (see graphic). At the subcommittee's request, GAO discussed challenges the nation faces in protecting our critical infrastructures and addressing federal information security.
DTIC
Information Systems; Terrorism; Intelligence; Computer Techniques

20020074796 Secretary of the Air Force, Washington, DC USA
Communications and Information: Postal Augmentee Orientation
Aug. 01, 1997; 14p; In English; Supersedes AFPAM37-105, dated 16 Jan. 1995
Report No.(s): AD-A404987; AFPAM-33-305; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This pamphlet implements Department of Defense (DoD) 4525.6-M, DoD Postal Manual, Volume I, with Change 1, December 1989, and Volume II, February 1987, with Change 1. This pamphlet is an orientation guide for personnel tasked to augment overseas postal units during a wartime or contingency situation. It includes information on augmentee duties and instructions for preparing for deployment to overseas areas. It defines what augmentees should know before deploying, and

addresses most major tasks an augmentee may have to perform. Military and civilian supervisors should use this pamphlet as a means to familiarize personnel selected as postal augmentees with their duties.
DTIC
Armed Forces (USA); Documents

20020074798 Secretary of the Air Force, Washington, DC USA
Communications and Information: Compendium of Communications and Information Terminology
Feb. 01, 2002; 224p; In English; Supersedes AFDIR33-303, dated 1 Nov. 1999
Report No.(s): AD-A404985; AFDIR33-303; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

There are a number of different glossaries and other documents published within the Federal government, Department of Defense (DoD), and the Air Force that list communications and information terms and definitions. This directory is designed to help minimize the differences and conflicts between communications and information and IA terms, standardize them as much as possible, and reduce unnecessary proliferation. The focus of this compendium is on communications and information, and IA terms, not on general-purpose Air Force or major command (MAJCOM) unique terms.
DTIC
Armed Forces (USA); Directories; Terminology

20020074809 Secretary of the Air Force, Washington, DC USA
Communications and Information: Records Management Program
Dec. 01, 1998; 12p; In English; Supersedes AFI37-122, dated 11 Jan. 1994
Report No.(s): AD-A404988; AFI33-322; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document is substantially revised and must be completely reviewed. This is a total rewrite of Air Force Instruction (AFI) 37-122. It transfers the responsibility for the Air Force Records Management Program from the Office of the Secretary of the Air Force (SAF/AAI) to Headquarters USA Air Force (HQ USAF/SC) and HQ AFCIC/ITC; redefines roles and responsibilities at all levels; deletes specific process statements to be incorporated in other instructions; adds requirements applicable to contractor records; adds responsibility for record custody to the chief of an office of record; and clarifies support agreement requirement for tenant units.
DTIC
Records Management; Education

20020074826 Naval Postgraduate School, Monterey, CA USA
Centralizing to Achieve Information Superiority
Jordan, Terry L.; Voce, Russell S.; Jun. 2002; 98p; In English; Original contains color images
Report No.(s): AD-A404868; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The purpose of this thesis is to propose a potential organizational structure for effectively utilizing Information Operations (IO) within the Department of Defense (DOD), This thesis is in response to a request for research from the vice commander of the 193 Special Operations Wing. According to this individual, the FY 1999 Joint War-fighting Capabilities Assessment, IO panel cycle, highlighted various deficiencies ranging from inadequate manning and force structure, to ineffective planning and integration processes, to inadequate capabilities available to support CINC requirements. Currently no one federal agency or military department has total responsibility or authority to bring all the disparate, but dependent, IO function/requirements together. As a result, funding, personnel resourcing, and control is fragmented to the detriment of the nation's war-fighting capabilities. As demonstrated by the above finding, the subject of IO has pervaded numerous war-fighting commands, doctrinal documents, and future vision plans. Despite this pervasion, there is no single agency within DOD that has the sole responsibility for providing or prosecuting information operations. The thesis will answer the question: What is an effective organizational structure for providing information operations that produces the synergistic effects of centralization without reducing the gains achieved at unit levels by having a decentralized approach? The answer to this question will provide an organizational model that may be applied to any individual service, or DOD as a whole, to provide an organized approach to IO. The authors of this thesis do not contend that this model will be the only way to organize for IO, only one way to organize for IO.
DTIC
Planning; Utilization; Information Management; Defense Program; Support Systems

20020074832 Secretary of the Air Force, Washington, DC USA

Information Operations Air Force Doctrine Document 2-5

Jan. 04, 2002; 81p; In English; Original contains color images

Report No.(s): AD-A404833; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

No Abstract

DTIC

Military Operations; Electronic Warfare

20020074842 Central Contractor Registration Assistance Center, Battlecreek, MI USA

Central Contractor Registration Handbook (CCR)

Mar. 2002; 22p; In English

Report No.(s): AD-A404920; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Central Contractor Registration (CCR) is the primary vendor database for the Department of Defense (DoD), NASA, Department of Transportation (DoT), and Department of Treasury. The CCR collects, validates, stores and disseminates data in support of agency missions. Both current and potential government vendors are required to register in CCR in order to do be awarded contracts by the DoD, NASA, DoT and Treasury. Vendors are required to complete a one-time registration to provide basic information relevant to procurement and financial transactions. Vendors must update or renew their registration annually to maintain an active status. CCR validates the vendor's information and electronically shares the secure and encrypted data with the federal agencies' finance offices to facilitate paperless payments through electronic funds transfer (EFT). Additionally, CCR shares the data with several government procurement and electronic business systems. Please note that any information provided in your registration may be shared with authorized government offices. Registration does not, however, guarantee business with the government.

DTIC

Data Bases; Contractors; Government Procurement

20020075014 Corps of Engineers, Washington, DC USA

USACE IT/IM Migration Strategy. Decision Briefing Board of Directors

Feb. 05, 1998; 26p; In English

Report No.(s): AD-A405215; No Copyright; Avail: CASI; A03, Hardcopy

The IM mission is to provide USACE employees and contractors with the capability to readily acquire, store, share, use disseminate, and protect the information needed to successfully accomplish their jobs; and to acquire and sustain an IT environment that supports USACE business strategies and goals while improving mission performance and customer satisfaction.

DTIC

Data Management; Information Systems

20020075021 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA

A Catalog of Graphic Symbols Used at Maintenance Control Centers: Toward a Symbol Standardization Process

Ahlstrom, Vicki; Muldoon, Robert; Apr. 2002; 93p; In English; Original contains color images

Report No.(s): AD-A405172; DOT/FAA/CT-TN02/12; ACT-530/ACB-220; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This document catalogs the symbols presented with the various interfaces used by Federal Aviation Administration Airway Facilities specialists. It includes a high-level overview of each system and the symbols and coding conventions used. These data were collected through analysis of software specifications, computer-based instruction manuals, and field site visits. The visits to field sites allowed verification of information from other sources and provided information about the environments that can affect the discrimination of visual symbols. Researchers used the information from the Human Factors Design Guide, International Organization for Standardization standards, and other sources to provide recommendations for visual symbols. The researchers used this information to evaluate the symbols used at Maintenance Control Centers, taking into consideration the observed environmental conditions, and provided recommendations toward a goal of symbol standardization.

DTIC

Coding; Standardization; Symbols; Air Traffic Control

20020075025 Secretary of the Air Force, Washington, DC USA
Communications and Information: Information Protection
Knowles, Neil C.; Dec. 01, 1996; 17p; In English
Report No.(s): AD-A405034; AFPD33-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Information demands to support Air Force Operations have intensified at an exponential rate. to satisfy this demand, the Air Force needs a transparent infosphere that must provide accurate, timely, and secure information in any required form, at any time and place. to assure the availability, integrity, and confidentiality of information and information dependent systems, and the information requried to support operations, the following information protection (IP) policy is established.
Derived from text
Information Systems; Security

20020075029 Secretary of the Air Force, Washington, DC USA
Communications and Information: Base-Level Planning and Implementation
Champlin, Gerard; May 10, 2001; 74p; In English
Report No.(s): AD-A405053; AFI33-104; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This instruction applies to personnel working in base-level communications and information systems planning and implementation functions and those who require, plan, install, modify, relocate, or remove communications and information systems. This instruction provides guidance in standardizing the planning and implementation of communications and information systems into a base-level infrastructure. It also provides procedures critical for day-to-day management of planning, implementation, and resources; and identifies general managerial tasks, applicable references and methods of accomplishment. This instruction refers to implementation using organic Air Force and contracted resources.
DTIC
Information Systems; Management Planning; Military Technology; Telecommunication

20020075034 Secretary of the Air Force, Washington, DC USA
Administrative Orders
Feb. 01, 1999; 20p; In English
Report No.(s): AD-A405019; AFI33-328; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Administrative orders are written directives, published by a commander or other competent authority, which direct actions or announce decisions. Order-publishing officials must follow this instruction and the appropriate functional directives governing the order. Four types of administrative orders exist: special, reserve, aeronautical, and movement.
DTIC
Management; Procedures; Information Management

20020075035 Secretary of the Air Force, Washington, DC USA
Communications and Information: Information Assurance (IA) Awareness Program
Sep. 21, 2001; 11p; In English
Report No.(s): AD-A405017; AFI33-204; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This document is substantially revised and must be completely reviewed. This revision changes the term 'Security Awareness, Training, and Education (SATE) Program' to 'Information Assurance Awareness Program' and updates the focus of this instruction. It deletes the requirement for training and education to be part of the awareness program and refers you to the applicable instructions for the training requirements. This update deletes the requirement for SATE biennial workshops, staff assistance visits, and major command (MAJCOM) or locally conducted workshops. It also deletes all references to reporting metrics and using the IA computer-based tutorial. The revision makes it mandatory for field operating agencies (FOA) and direct reporting units (DkU) to participate in their supporting host wing IA awareness program. It requires wing IA offices to ensure government contractors follow the provisions of this AFI when using government information systems. It adds responsibilities to the USA Air Force Academy (USAFA) and, due to organizational changes, the Deputy Chief of Staff/Communications and Information replaces the Air Force Communications and Information Center. The () preceding the publication title indicates a major revision from the previous edition.
DTIC
Security; Procedures; Telecommunication; Armed Forces (USA)

20020075036 Secretary of the Air Force, Washington, DC USA

Publications Management Program

May 06, 2002; 202p; In English

Report No.(s): AD-A405032; AFI33-360-VOL-1; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This volume implements Air Force Policy Directive (AFPD) 37-1, Air Force Information Management (will convert to AFPD 33-3). It prescribes and explains how to create and manage Air Force publications and to whom they apply. It covers the procedures and standards that govern management of standard publications throughout the Air Force. It also carries out the tenets of Executive Order (E.O.) 12861, Elimination of One-Half of Executive Branch Internal Regulations, September 11, 1993; and E.O. 12866, Regulatory Planning and Review Planning and Review, September 30, 1993. It applies to all Air Force personnel who prepare, manage, review, certify, approve, or use publications.

DTIC

Procedures; Documents; Armed Forces (USA)

20020075038 Secretary of the Air Force, Washington, DC USA

Air Force Privacy Act Program

Nov. 08, 2000; 45p; In English

Report No.(s): AD-A405024; AFI33-332; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

This instruction implements AFPD 37-1, Air Force Information Management (will convert to AFPD 33-3). It also implement Department of Defense (DoD) directive 5400.11, Department of Defense Privacy Program, June 9, 1982, and DoD 5400.11-R, Department of Defense Privacy Program, August 1983. It sets guidelines for collecting, safeguarding, maintaining, using, accessing, amending and disseminating personal data kept in systems of records to comply with the Air Force Privacy Act Program. It takes precedence over any other instruction that deals with personal privacy and rights of individuals regarding their records. This instruction applies to the Air Force Reserve, Air National Guard, and those combatant commands where the Air Force is the executive agent. Use of the term 'MAJCOM' through this instruction includes MAJCOMs, FOAs, and DRUs. Send all supplements to this instruction to Headquarters USA Air Force (HQ USAF/SCTIR), 1250 Air Force Pentagon, Washington DC 20330-1250. Send recommended changes or comments to Headquarters Air Force Communications Agency (HQ AFCA/ITPP), 203 W. Losey Street, Room 1100, Scott AFB IL 62225-5222, through appropriate channels, using AF Form 847, Recommendation for Change of Publication, with an information copy to HQ USAF/SCTIR. Refer to Attachment 1 for a glossary of references and supporting information.

DTIC

Records Management; Procedures; Privacy; Armed Forces (USA)

20020075718 Secretary of the Air Force, Washington, DC USA

Air Force Instruction 33-320 Communications and Information Federal Register

May 15, 2002; 13p; In English

Report No.(s): AD-A405039; AFI33-320; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This instruction implements Air Force Policy Directive (AFPD) 37-1, Air Force Information Management (will convert to AFPD 33-3), Department of Defense Directive (DoDD) 5025.1, DoD Directives System, July 27, 2000; Department of Defense (DoD) 5025. 1-M, DoD Directives System Procedures, October 1, 2001 (draft); and Office of the Secretary of Defense (0SD) Administrative Instruction No. 102, Office of the Secretary of Defense (OSD) Federal Register (FR) System, August 6, 1999. It gives guidance on the overall Federal Register (FR) system and tells how to submit rules and notices affecting the public for publication in the FR except as applies to Privacy Act system notices (Air Force Instruction AFI 33-332, Air Force Privacy' Act Program). It also establishes procedures for automatic distribution of the FR and the Code of Federal Regulations (CFR) to Air Force organizations. It explains which kinds of rules should be published in the FR after the Air Force has accepted them with change or no change.

DTIC

Records Management; Education

20020075719 Secretary of the Air Force, Washington, DC USA

Forms Management Program, Volume 2

Jun. 27, 2000; 36p; In English

Report No.(s): AD-A405038; AFI33-360-VOL-2; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The Air Force Force's Management Program exists as a means to manage the collection, storage, retrieval, and display of standardized data by using paper or electronic media. MAJCOMs or FOAs may centralize or decentralize their local programs.

If a MAJCOM or FOA has a centralized forms management program, it may use a single organizational designation for its field forms, instead of separate command, headquarters, joint use, or field activity forms.
DTIC
Records Management; Education; Forms (Paper)

20020075720 Secretary of the Air Force, Washington, DC USA
Requirements Development and Processing
Richards, Dennis L.; Mar. 18, 1999; 32p; In English
Report No.(s): AD-A405037; AFI33-103; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Air Force instruction (AFI) implements Air Force Policy Directive (AFPD) 33-1, and it details a process to streamline the development of and response to communications and information systems requirements. It also provides an oversight procedure to maintain the integrity of the process. The communications and information systems requirements process enables users to obtain new, nondevelopmental information technology (IT) capabilities with total program cost of less than or equal to $15 million, and to sustain existing IT systems. Information technology is defined by OMB Circular A-130 as: the hardware and software used for Government information, regardless of technology involved, whether computers, communications, micrographics, or others. Those systems expected to cost more than $15 million, that involve development, or require an interface to support joint operations must follow procedures outlined in AFPD 10-6, Mission Needs and Operational Requirements, and AFI 10-601, Mission Needs and Operational Requirements Guidance and Procedures.
Author
Information Systems; Communication Networks

20020075998 Argonne National Lab., IL USA
Iqaris : a tool for the intelligent querying, analysis, and retrieval from information systems.
Hummel, J. R.; Silver, R. B.; Apr. 26, 2002; 7p; In English
Report No.(s): DE2001-795844; ANL/DIS/CP-107533; No Copyright; Avail: Department of Energy Information Bridge, Microfiche

Information glut is one of the primary characteristics of the electronic age. Managing such large volumes of information (e.g., keeping track of the types, where they are, their relationships, who controls them, etc.) can be done efficiently with an intelligent, user-oriented information management system. The purpose of this paper is to describe a concept for managing information resources based on an intelligent information technology system developed by the Argonne National Laboratory for managing digital libraries. The Argonne system, Intelligent Query (IQ), enables users to query digital libraries and view the holdings that match the query from different perspectives.
NTIS
Information Systems; Information Management; Data Base Management Systems

20020076114 Purdue Univ., School of Industrial Engineering, West Lafayette, IN USA
Information Assurance in Networked Enterprises: MICSS Class Experiments and Industry Survey Analysis
Ray, Parbati; Jun. 2001; 37p; In English; Original contains color images
Report No.(s): AD-A405071; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two surveys have been developed to ascertain the information assurance requirements of networked enterprises. The surveys give an insight into how inter-networked companies use their ERP systems, what their current policies maybe with respect to information management, and what their security and assurance problems maybe. The surveys focus on the views of the information manager the firm and on the department managers of those departments that depend mostly on their information systems for smooth running. The survey questions have been based on quantitative analysis done by experiments using an ERP software simulator, MICSS (Management Interactive Case Study Simulator). The logic and procedures used to develop the surveys has been presented. The results obtained from the analysis of the survey replies will enable the design of autonomous agent and active protocols to help companies automatically assure their information.
DTIC
Industries; Information Management; Surveys; Computer Networks; Simulators

20020076213 Centra 2000, Inc., Houston, TX USA
Data Management System
Spinoff 1997; 1997, pp. 104; In English; Original contains color illustrations; ISBN 0-16-049155-X; No Copyright; Avail: CASI; E99, Hardcopy; There is no charge for this publication. Shipping and handling charges may apply.

CENTRA 2000 Inc., a wholly owned subsidiary of Auto-trol technology, obtained permission to use software originally developed at Johnson Space Center for the Space Shuttle and early Space Station projects. to support their enormous information-handling needs, a product data management, electronic document management and work-flow system was designed. Initially, just 33 database tables comprised the original software, which was later expanded to about 100 tables. This system, now called CENTRA 2000, is designed for quick implementation and supports the engineering process from preliminary design through release-to-production. CENTRA 2000 can also handle audit histories and provides a means to ensure new information is distributed. The product has 30 production sites worldwide.
Author
Data Management; Tables (Data); Data Bases; Manufacturing

20020076300 Johns Hopkins Univ., Research Projects Administration, Baltimore, MD USA
DMSP SSJ4 Data Restoration, Classification, and On-Line Data Access ***Final Report***
Wing, Simon, Johns Hopkins Univ., USA; [2000]; 1p; In English
Contract(s)/Grant(s): NAG5-7189; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Compress and clean raw data file for permanent storage We have identified various error conditions/types and developed algorithms to get rid of these errors/noises, including the more complicated noise in the newer data sets. (status = 100% complete). Internet access of compacted raw data. It is now possible to access the raw data via our web site, http://www.jhuapl.edu/Aurora/index.html. The software to read and plot the compacted raw data is also available from the same web site. The users can now download the raw data, read, plot, or manipulate the data as they wish on their own computer. The users are able to access the cleaned data sets. Internet access of the color spectrograms. This task has also been completed. It is now possible to access the spectrograms from the web site mentioned above. Improve the particle precipitation region classification. The algorithm for doing this task has been developed and implemented. As a result, the accuracies improved. Now the web site routinely distributes the results of applying the new algorithm to the cleaned data set. Mark the classification region on the spectrograms. The software to mark the classification region in the spectrograms has been completed. This is also available from our web site.
Author
DMSP Satellites; Data Processing; Algorithms

84
LAW, POLITICAL SCIENCE AND SPACE POLICY

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

20020076380 Agency for International Development, Washington, DC USA
From Commitment to Action: Meeting the Challenge of ICPD
2002; In English; This document is color dependent and/or in landscape layout. It is currently available on CD-ROM
Report No.(s): PB2002-109075; No Copyright; Avail: National Technical Information Service (NTIS)

USAID and its family of development partners are proud of their achievements leading up to, and since the 1994 International Conference on Population and Development (ICPD). This report examines USAID's progress in helping to implement the 20-year recommendations of the final conference document, the ICPD Program of Action. Though the report focuses on the ICPD core objectives in reproductive health, gender equity, and population stabilization, USAID programs in other areas--economic development, environment, democracy building, and child survival among them-- all support the ICPD vision of sustainable development and quality of life for all people.
NTIS
Economic Development; Developing Nations

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.

20020076112 Ohio State Univ., Research Foundation, Columbus, OH USA
GPS Satellite Clock Estimation Every 30 Seconds and Application to Accurate Absolute Positioning ***Final Report, 12 Sep. 1995-5 Jul. 1998***
Han, Shin -Chan; Jekeli, Christopher; Aug. 1998; 22p; In English
Contract(s)/Grant(s): F19628-96-C-0169; Proj-DMAP
Report No.(s): AD-A405073; AFRL-VS-TR-2000-1607; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report presents the results of investigations to determine very accurate position coordinates using the Global Positioning System in the absolute (point) positioning mode. The most common method to obtain very accurate positions with GPS is to apply double-differencing procedures whereby GPS satellite signals are differenced at a station and these differences are again differenced with analogous differences at other stations. The differencing between satellites eliminates the large receiver clock errors, while the between-station differences eliminate the large satellite clock errors (as well as some other errors, such as orbit error). However, only coordinate differences can be determined in this way and the accuracy depends on the baseline length between cooperating stations. The strategy with accurate point positioning is to estimate GPS satellite clock errors independently, thus obviating the between-station differencing. The clock error estimates are then used in an application of a single-difference (between-satellite) positioning algorithm at any site to determine the coordinates without reference to any other site. Using IGS orbits and stations, the GPS clock errors were estimated at 30-second intervals and these estimates were compared to values determined by JPL. The agreement was at the level of about 0.1 nsec (3 cm). The absolute positioning technique was tested at a stationary site (IGS station) whose coordinates are known. The differences between the estimated absolute position coordinates and the known values had a standard deviation less than 4 cm in all three dimensions, with mean differences ranging from 3.4 cm to 6.3 cm.
DTIC
Global Positioning System; Error Analysis; Algorithms; Artificial Satellites

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.

20020076409 Space Telescope Science Inst., Baltimore, MD USA
Teaching, Learning, and Planetary Exploration ***Final Report***
Brown, Robert A., Space Telescope Science Inst., USA; [2002]; 25p; In English
Contract(s)/Grant(s): NAG5-3762; STScI Proj. J0511; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is the final report of a program that examined the fundamentals of education associated with space activities, promoted educational policy development in appropriate forums, and developed pathfinder products and services to demonstrate the utility of advanced communication technologies for space-based education. Our focus was on space astrophysics and planetary exploration, with a special emphasis on the themes of the Origins Program, with which the Principal Investigator (PI) had been involved from the outset. Teaching, Learning, and Planetary Exploration was also the core funding of the Space Telescope Science Institute's (ST ScI) Special Studies Office (SSO), and as such had provided basic support for such important NASA studies as the fix for Hubble Space Telescope (HST) spherical aberration, scientific conception of the HST Advanced Camera, specification of the Next-Generation Space Telescope (NGST), and the strategic plan for the second decade of the HST science program.
Author
Education; Space Exploration; Astrophysics

89
ASTRONOMY

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

20020074612 NASA Ames Research Center, Moffett Field, CA USA
Kepler Mission: A Search for Terrestrial Planets
Koch, D., NASA Ames Research Center, USA; Borucki, W., NASA Ames Research Center, USA; Jenkens, J., NASA Ames Research Center, USA; Dunham, E., NASA Ames Research Center, USA; Jun. 22, 2001; 1p; In English; Formation of Extrasolar Planets Minisymposium/JENAM, 10-14 Sep. 2001, Munich, Germany
Contract(s)/Grant(s): RTOP 853-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

The Kepler Mission is a search for terrestrial planets by monitoring a large ensemble of stars for the periodic transits of planets. The mission consists of a 95-cm aperture photometer with 105 square deg field of view that monitors 100,000 dwarf stars for four years. The mission is unique in its ability to detect Earth-size planets in the habitable zone of other stars in the extended solar neighborhood. An Earth-size transit of a solar-like star causes a change in brightness of about 100 ppm. Laboratory testing has demonstrated that a total system noise level of 20 ppm is readily achievable on the timescale of transits. Earth-like transits have been created and reliably measured in an end-to-end system test that has all known sources of noise including, spacecraft jitter. to detect Earth-size planets, the photometer must be spaceborne; this also eliminates the day-night and seasonal cycle interruptions of ground-based observing. The photometer will stare at a single field of stars for four years, with an option to continue for two more years. This allows for detection of four transits of planets in Mars-like orbits and detection of planets even smaller than Earth especially for short period orbits, since the signal to noise improves as the square root of the number of transits observed. In addition to detection of planets, Kepler data are also useful for understanding the activity cycles and rotation rates of the stars observed. For the 3,000 stars brighter than mv= 11.4 p-mode oscillations are measured. The mission has been selected as one of three candidates for NASA's next Discovery mission.
Author
Terrestrial Planets; Dwarf Stars; Solar Neighborhood; End-to-End Data Systems; Activity Cycles (Biology); Space Missions

20020074678 Academy of Sciences (USSR), Space Research Inst., Moscow, USSR
Radar Speckle Displacement Interferometry to Study Moon's Polar Axis Behaviour in the Sky
Holin, I. V., Academy of Sciences (USSR), USSR; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 25; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Radar Speckle Displacement Interferometry (RSDI) is a new on principle Earth-based radar technique which allows precise measurement of instantaneous rotational-progressive motion components of distant bodies. It is based on the effect of speckle displacement or far coherence of speckled radar fields scattered by rough surfaces of moving objects. RSDI examinations in practice of radar astronomy have been successfully initiated in 2001-2002 both in Europe and in the USA In particular, RSDI is considered as one of most promising ground-based techniques to solve the problem of Mercury's obliquity and librations. It was proposed in how Moon's physical librations can be measured. Below RSDI possibilities are discussed as applied to estimation of Moon's instantaneous spin axis orientation in the sky and its variation with time.
Author
Speckle Interferometry; Librational Motion; Lunar Rotation; Spin Dynamics

20020074717 Colorado School of Mines, Faculty of Engineering, Golden, CO USA
Study Towards Human Aided Construction of Large Lunar Telescopes
vanSusante, P. J., Colorado School of Mines, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 64; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

On the Moon, unique situations exist for observing the universe. The Polar areas contain permanently shadowed areas, which are among the coldest places in our solar system, within which the infrared background radiation that can disturb measurements is very low. Also disturbances generated on Earth are mostly out of view and thus the measurements can be much more sensitive in all wavelengths. The South Pole offers a good location for building such an observatory. Clementine mission data indicate that permanently shadowed areas are located within a few kilometers of a areas that are almost permanently lit by the sun. by placing a communication relay on one of the lunar mountains it is also possible to have a communications link for periods in which these shadowed areas can not be seen directly from Earth. The South Polar region of the Moon is also interesting geologically because it is located inside the largest basin on the moon (South Pole - Aitken Basin) as well as the possibility that ice may exist there. Shackleton Crater is suggested as a site for the placement and construction of the Lunar South Pole Infrared Telescope together

with a communication relay lander at Malapert Mountain and another communication relay and energy supply lander at the Peak of Eternal Light, located near the rim of Shackleton. A near infrared telescope has been designed for emplacement in Shackleton that appears to have the same capabilities as the Next Generation Space Telescope except for sky coverage, which will be limited by the location and orientation. The telescope has a diameter of 8 meters and is an altitude-azimuth design. The bearings will be made of superconducting magnets that use fluxpinning to stabilize themselves while at the same time they are very energy-efficient. The foundation will be dug and constructed in-situ using robots and telepresence together with virtual reality and local laser rangefinders. If all goes well the telescope would have settlement no greater than 0,03 mm during operation. It would be possible for astronauts to maintain, repair and upgrade the telescope much in the same way that the Hubble Space Telescope has been maintained. When the telescope is built, an infrastructure will also have been created for energy supply and communications that can be used in subsequent missions. The total mission can be achieved by launching 3 Ariane 5 rockets in the year 2006 configuration that can launch 20,000 kg into GTO. New studies of the construction of even larger telescopes have also been undertaken.. One additional aspect that will be very important is the synergy between humans and robots and their role in transport, construction, operation, maintenance, etc. is addressed in these new studies. Also an attempt will be made to make a parametric cost model for different scenario's as well as the technology readiness levels for the techniques necessary to build a telescope with the capacity of the 'planet finder', equivalent up to 1000 sq m of photon collecting surface. Part of the scenario definition and conceptual design of a large lunar telescope has also been done in the lunar base design workshop, held from 10-21 of June at ESTEC, NL. After the conceptual phase there will be a more engineering oriented workshop, which will be held in the concurrent design facility at ESTEC. This paper includes discussion of recent progress on these studies.
Author
Lunar Observatories; Robotics; Lunar Shadow; Infrared Telescopes; Communication Networks

20020074721 NASA Goddard Space Flight Center, Greenbelt, MD USA
Grand Observatory
Young, Eric W., NASA Goddard Space Flight Center, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 68; In English; Also announced as 20020074653; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Various concepts have been recently presented for a 100 m class astronomical observatory. The science virtues of such an observatory are many: resolving planets orbiting around other stars, resolving the surface features of other stars, extending our temporal reach back toward the beginning (at and before stellar and galactic development), improving on the Next Generation Space Telescope, and other (perhaps as yet) undiscovered purposes. This observatory would be a general facility instrument with wide spectral range from at least the near ultraviolet to the mid infrared. The concept espoused here is based on a practical, modular design located in a place where temperatures remain (and instruments could operate) within several degrees of absolute zero with no shielding or cooling. This location is the bottom of a crater located near the north or south pole of the moon, most probably the South Polar Depression. In such a location the telescope would never see the sun or the earth, hence the profound cold and absence of stray light. The ideal nature of this location is elaborated herein. It is envisioned that this observatory would be assembled and maintained remotely through the use of expert robotic systems. A base station would be located above the crater rim with (at least occasional) direct line-of-sight access to the earth. Certainly it would be advantageous, but not absolutely essential, to have humans travel to the site to deal with unexpected contingencies. Further, observers and their teams could eventually travel there for extended observational campaigns. Educational activities, in general, could be furthered thru extended human presence. Even recreational visitors and long term habitation might follow.
Author
Astronomical Observatories; Near Infrared Radiation; Spaceborne Telescopes; Expert Systems

20020074767 Virginia Univ., Dept. of Astronomy, Charlottesville, VA USA
Hubble Space Telescope Photometry of Mimas, Enceladus, Tethys, Dione, and Rhea
Verbiscer, A., Virginia Univ., USA; French, R., Wellesley Coll., USA; McGhee, C., Wellesley Coll., USA; Solar System Remote Sensing; 2002, pp. 89; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The innermost of Saturn's classical satellites, Mimas and Enceladus, have historically proven challenging observing targets for Earth-based telescopes due to their proximity to the bright planet and rings. Since the ring plane crossings in 1995 and 1996, in preparation for the upcoming Cassini mission in 2004, the Hubble Space Telescope's Wide-Field Planetary Camera (WFPC2) has been monitoring the Saturn system at each opposition as well as near quadrature each year. This observing program has provided numerous images of Saturn's classical satellites in each of the five WFPC2 wideband UVBRI filters (F336W, F439W,

F555W, F675W, and F814W) and occasionally in the F255W, F785LP, and F1042M filters at solar phase angles between 0.26 deg and 6.4 deg.
Author
Mimas; Enceladus; Hubble Space Telescope; Astronomical Photometry

20020074893 Boston Univ., Center for Space Physics, Boston, MA USA
Space Effects on Air Force Systems
Hughes, W. J.; May 02, 2000; 8p; In English
Contract(s)/Grant(s): F19628-99-C-0028; Proj-2822
Report No.(s): AD-A405108; AFRL-VS-TR-2000-1544; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche
This report outlines the new and innovative technical work carried out by Boston University for the development of a novel, reliable space imaging experiment and to enhance the reliability of instrumentation to be launched that will measure space plasma parameters.
DTIC
Imaging Techniques; Spaceborne Experiments

20020076041 Massachusetts Inst. of Tech., Center for Space Research, Cambridge, MA USA
Micro-System Technology for X-ray Astronomy ***Final Report***
Schattenburg, Mark L., Massachusetts Inst. of Tech., USA; Sep. 18, 2002; 11p; In English
Contract(s)/Grant(s): NAG5-5271
Report No.(s): OSP-6890567; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche
This research investigation was devoted to developing micro-system and nanotechnology for x-ray astronomy optics. The goal was to develop and demonstrate new types of lightweight, high accuracy x-ray optics for future high throughput, high resolution x-ray telescopes such as Constellation X (Con-X) and MAXIM. A number of significant accomplishments were reported under this program, which are summarized below. Most of this work has been reported in journal and conference proceedings and in presentations to NASA and at international meeting (see Bibliography).
Author
X Ray Astronomy; Nanotechnology; X Ray Optics; X Ray Telescopes; Constellations

20020076079 NASA Ames Research Center, Moffett Field, CA USA
Solar System Studies with the Space Infrared Telescope Facility (SIRTF)
Cruikshank, Dale P., NASA Ames Research Center, USA; [1998]; 2p; In English; 30th Annual Meeting of the Division for Planetary Sciences of the American Astronomical Society, 12-16 Oct. 1998, Madison, WI, USA; Sponsored by American Astronomical Society, USA
Contract(s)/Grant(s): RTOP 839-01-02-01; No Copyright; Avail: Issuing Activity; Abstract Only
SIRTF (Space Infrared Telescope Facility) is the final element in NASA's 'Great Observatories' program. It consists of an 85-cm cryogenically-cooled observatory for infrared astronomy from space. SIRTF is scheduled for launch in late 2001 or early 2002 on a Delta rocket into a heliocentric orbit trailing the Earth. Data from SIRTF will be processed and disseminated to the community through the SIRTF Science Center (SSC) located at the Infrared Processing and Analysis Center (IPAC) at Caltech. Some 80/% of the total observing time (estimated at a minimum of 7500 hours of integration time per year for the mission lifetime of about 4 years) will be available to the scientific community at large through a system of refereed proposals. Three basic instruments are located in the SIRTF focal plane. The Multiband Imaging Photometer (MIPS), the Infrared Array Camera (IRAC), and the Infrared Spectrometer (IRS), taken together, provide imaging and spectroscopy from 3.5 to 160 microns. Among the solar system studies suited to SIRTF are the following: 1) spectroscopy and radiometry of small bodies from the asteroid main belt, through the Trojan clouds, to the Kuiper Disk; 2) dust distribution in the zodiacal cloud and the Earth's heliocentric dust ring; 3) spectroscopy and radiometry of comets; and 4) spectroscopy and radiometry of planets and their satellites. Searches for, and studies of dust disks around other stars, brown dwarfs, and superplanets will also be conducted with SIRTF. The SORTIE web site (http://ssc.ipac.caltech.edu/sirtf) contains important details and documentation on the project, the spacecraft, the telescope, instruments, and observing procedures. A community-wide workshop for solar system studies with SIRTF is in the planning stages by the author and Martha S. Hanner for the summer of 1999.
Author
Infrared Spectrometers; Infrared Astronomy; Infrared Spectroscopy; Space Infrared Telescope Facility

20020076304 Massachusetts Inst. of Tech., Center for Space Research, Cambridge, MA USA
A Search for Evidence of Non-Thermal Emission from the Supernova Remnants 37A/B ***Final Report***
Oliversen, R., Massachusetts Inst. of Tech., USA; [2002]; 1p; In English
Contract(s)/Grant(s): NAG5-9211; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The ADP grant NAG5-9211 entitled 'A Search for Evidence of Non-Thermal Emission from the Supernova Remnants 37 A/B' was not used to support an analysis of the ASCA data for these two remnants because the ASCA mission ended before the remnants were observed. The grant was used to support similar research on two remnants in the Large Magellanic Cloud, N132D and N 103B. An analysis of the Chandra data for these two remnants exhibits some evidence of non-thermal emission from small regions in the remnants. The X-ray spectra for these regions can not be adequately described by a single thermal X-ray emission model. However, if an X-ray synchrotron component is also included, the spectral data can be well described by the model and the values of the fit parameters are consistent with the values expected. These results were presented at the 199th Meeting of the American Astronomical Society. In summary, the grant has enabled us to strengthen the evidence that supernova remnants outside our Galaxy can also accelerate electrons to very-high energies. The results of this analysis will be published soon in the Astrophysical Journal,
Author
Supernova Remnants; X Ray Spectra; X Ray Spectroscopy; Astronomical Models

90
ASTROPHYSICS

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

20020074556 NASA Ames Research Center, Moffett Field, CA USA
The Generation of Lighting in the Solar Nebula
Cuzzi, Jeffrey, NASA Ames Research Center, USA; Desch, S. J., NASA Ames Research Center, USA; [1998]; 1p; In English
Contract(s)/Grant(s): RTOP 344-37-22-03; Copyright; Avail: Issuing Activity; Abstract Only

The process that melted and formed the chondrules, mm-sized glassy beads within meteorites, has not been conclusively identified. Origin by lightning in the solar nebula is consistent with many features of chondrules, but no viable model of lightning has yet been advanced. We present a model demonstrating how lightning could be generated in the solar nebula which differs from previous models in three important aspects. First, we identify a new', powerful charging mechanism that is based on the differences in contact potentials between particles of different composition, a form of triboelectric charging. In the presence of fine silicate grains and fine iron metal grains, large silicate particles (the chondrules) can acquire charges of +10(exp 5) e. Second, we assume that the chondrule precursor particles are selectively concentrated in clumps 1 - 100 km in size by the turbulent concentration mechanism described by Cuzzi et al. (1996). The concentration of these highly charged particles into clumps, in a background of negatively charged metal grains, is what generates the strong electric fields. Third, we make refinements in the estimates of the breakdown electric field and the ionization rate. We calculate that electric fields large enough to trigger breakdown easily could have existed over regions large enough (approx. 100km) to generate very large discharges of electrical energy (approx. 10(exp 16)erg). The discharges would have been sufficiently energetic and frequent to have formed the chondrules. We place constraints on the generation of lightning and conclude that it could not be generated if the abundance of Al-26 in chondrules was as high as the level in the CAIs. This conclusion is consistent with isotopic analyses of chondrules. This possibly implies that Al-26 was non-uniformly distributed in the solar nebula or that the chondrules formed several Myr after the CAIs.
Author
Solar Nebula; Electric Fields; Lightning; Metal Particles; Charged Particles

20020074593 NASA Ames Research Center, Moffett Field, CA USA
Comet Grains: Their IR Emission and Their Relation to ISM Grains
Wooden, Diane H., NASA Ames Research Center, USA; Jun. 19, 2002; 1p; In English; International Astronomical Union Colloquium: Cometary Science After Hale-Bopp, 21-25 Jan. 2002, Tenerife, Spain; Sponsored by International Astronomical Union, Netherlands
Contract(s)/Grant(s): RTOP 344-37-22-07; Copyright; Avail: Issuing Activity; Abstract Only

Comets and the chodritic, porous interplanetary dust particles (CP IDPs) that they shed in their comae are reservoirs of primitive solar nebula materials. The high porosity and fragility of cometary grains and CP IDPs, and anomalously high deuterium contents of highly fragile, pyroxene-rich Cluster IDPs imply these aggregate particles contain significant abundances of grains from the interstellar medium (ISM). IR spectra of comets (3 - 40 micron) reveal the presence of a warm (nearIR) featureless

emission modeled by amorphous carbon grains. Broad and narrow resonances near 10 and 20 microns are modeled by warm chondritic (50% Fe and 50% Mg) amorphous silicates and cooler Mg-rich crystalline silicate minerals, respectively. Cometary amorphous silicates resonances are well matched by IR spectra of CP IDPs dominated by GEMS (0.1 micron silicate spherules) that are thought to be the interstellar Fe-bearing amorphous silicates produced in AGB stars. Acid-etched ultramicrotomed CP IDP samples, however, show that both the carbon phase (amorphous and aliphatic) and the Mg-rich amorphous silicate phase in GEMS are not optically absorbing. Rather, it is Fe and FeS nanoparticles embedded in the GEMS that makes the CP IDPs dark. Therefore, CP IDPs suggest significant processing has occurred in the ISM. ISM processing probably includes in He' ion bombardment in supernovae shocks. Laboratory experiments show He+ ion bombardment amorphizes crystalline silicates, increases porosity, and reduces Fe into nanoparticles. Cometary crystalline silicate resonances are well matched by IR spectra of laboratory submicron Mg-rich olivine crystals and pyroxene crystals. Discovery of a Mg-pure olivine crystal in a Cluster IDP with isotopically anomalous oxygen indicates that a small fraction of crystalline silicates may have survived their journey from AGB stars through the ISM to the early solar nebula. The ISM does not have enough crystalline silicates (is less than 5%) , however, to account for the deduced abundance of crystalline silicates in comet dust. An insufficient source of ISM Mg-rich crystals leads to the inference that most Mg-rich crystals in comets are primitive grains processed in the early solar nebula prior to their incorporation into comets. Mg-rich crystals may condense in the hot (approx. 1450 K), inner zones of the early solar nebula and then travel large radial distances out to the comet-forming zone. On the other hand, Mg-rich silicate crystals may be ISM amorphous silicates annealed at approx. 1000 K and radially distributed out to the comet-forming zone or annealed in nebular shocks at approx. 5 - 10 AU. Determining the relative abundance of amorphous and crystalline silicates in comets probes the relative contributions of ISM grains and primitive grains to small, icy bodies in the solar system. The life cycle of dust from its stardust origins through the ISM to its incorporation into comets is discussed.
Author
Comets; Dust; Interplanetary Dust; Interstellar Matter; Ion Irradiation; Cometary Atmospheres

20020074601 NASA Ames Research Center, Moffett Field, CA USA
Deuterium Enrichment of PAHs by VUV Irradiation of Interstellar Ices
Bernstein, Max P., NASA Ames Research Center, USA; Sandford, Scott A., NASA Ames Research Center, USA; Allamandola, Louis J., NASA Ames Research Center, USA; Gillette, J. Seb, Stanford Univ., USA; Zare, Richard N., Stanford Univ., USA; [1998]; 1p; In English
Contract(s)/Grant(s): RTOP 344-37-44-01; Copyright; Avail: Issuing Activity; Abstract Only

Laboratory results demonstrate that polycyclic aromatic hydrocarbons (PAHs) rapidly exchange their hydrogen atoms with those of nearby molecules when they are frozen into low-temperature ices and exposed to vacuum ultraviolet radiation. As a result, PAHs quickly become deuterium-enriched when VUV irradiated in D-containing ices. This mechanism has important consequences for several astrophysical issues owing to the ubiquitous nature of PAHs in the interstellar medium. For example, this process may explain the deuterium enrichments found in PAHs in meteorites and interplanetary dust particles. These results also provide general predictions about the molecular siting of the deuterium on aromatic materials in meteorites if this process produced a significant fraction of their D-enrichment.
Author
Deuterium; Enrichment; Polycyclic Aromatic Hydrocarbons; Hydrogen Atoms; Far Ultraviolet Radiation

20020074610 NASA Ames Research Center, Moffett Field, CA USA
Luminescence from VUV Irradiated Cosmic Ice Analogs and Organic Residues
Gudipati, Murthy S., Maryland Univ., USA; Dworkin, Jason P., NASA Ames Research Center, USA; Chillier, Xavier, Universite de Geneve, Switzerland; Allamandola, Louis J., NASA Ames Research Center, USA; [2002]; 1p; In English

Contract(s)/Grant(s): NCC2-1178; No Copyright; Avail: Issuing Activity; Abstract Only

The optical luminescent properties for a variety of vacuum-ultraviolet (VUV) irradiated cosmic ice analogs and the complex organic residues produced from irradiation might be applicable to Solar System and interstellar observations and processes for various astronomical objects with an ice heritage. Some examples include grain temperature determination and vaporization rates, nebula radiation balance, albedo values, color analysis, and biomarker identification. Detailed results are presented for the mixed molecular ice: H2O:CH3OH:NH3:CO (100:50:1:1), a realistic representation for an interstellar/precometary ice. The irradiated ices and the room-temperature residues resulting from this energetic processing have remarkable photoluminescent properties in the visible (520-570 nm). The luminescence dependence on temperature, thermal cycling, and VUV exposure of the residue is described.

Author

Photoluminescence; Atmospheric Radiation; Temperature Dependence; Optical Properties; Ice; Luminescence; Thermal Cycling Tests

20020074701 Brown Univ., Dept. of Geological Sciences, Providence, RI USA

Lunar Science Missions in Context of the Decadal Solar System Exploration Survey

Pieters, C. M., Brown Univ., USA; Bullock, M., Southwest Research Inst., USA; Greeley, R., Arizona State Univ., USA; Jolliff, B., Washington Univ., USA; Sprague, A., Arizona Univ., USA; Stofan, E., Proxemy Research, Inc., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 48; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Over the last year a broad and detailed assessment of the current status of science activities as well as research strategies for solar system exploration (SSE) was undertaken by a sub-committee of the NAS/NRC Space Studies Board. This study was requested by NASA to identify science priorities for the next decade of exploration. The report has been completed and is in the review process. This Decadal SSE Survey report is to be given to Dr. Ed Weiler, Associate Administrator for Space Science. It will be publicly released during the summer of 2002 in time for use in NASA's strategic planning. The study consisted of individual panels charged with making recommendations for particular aspects of solar system exploration and a Steering Committee, chaired by Mike Belton, who prepared an overview of compelling solar system science and identified cross-cutting issues. The panels prepared detailed reports that were submitted to the Steering Committee. The Steering Committee, which also contained a representative from each of the panels, prioritized the diverse panel recommendations into an integrated strategy, including prioritized recommendations.

Author

Management Planning; Mission Planning; Solar System

20020074726 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Photometric Modeling of a Cometary Nucleus: Taking Hapke Modeling to the Limit

Buratti, B. J., Jet Propulsion Lab., California Inst. of Tech., USA; Hicks, M. D., Jet Propulsion Lab., California Inst. of Tech., USA; Soderblom, L., Geological Survey, USA; Hillier, J., Grays Harbor Community Coll., USA; Britt, D., Tennessee Univ., USA; Solar System Remote Sensing; 2002, pp. 7; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

In the past two decades, photometric models developed by Bruce Hapke have been fit to a wide range of bodies in the Solar System: The Moon, Mercury, several asteroids, and many icy and rocky satellites. These models have enabled comparative descriptions of the physical attributes of planetary surfaces, including macroscopic roughness, particle size and size-distribution, the single scattering albedo, and the compaction state of the optically active portion of the regolith. One challenging type of body to observe and model, a cometary nucleus, awaited the first space based mission to obtain images unobscured by coma. The NASA-JPL Deep Space 1 Mission (DS1) encountered the short-period Jupiter-family comet 19/P Borrelly on September 22, 2001, about 8 days after perihelion. Prior to its closest approach of 2171 km, the remote-sensing package on the spacecraft obtained 25 CCD images of the comet, representing the first closeup, unobscured view of a comet's nucleus. At closest approach, corresponding to a resolution of 47 meters per pixel, the intensity of the coma was less than 1% of that of the nucleus. An unprecedented range of high solar phase angles (52-89 degrees), viewing geometries that are in general attainable only when a comet is active, enabled the first quantitative and disk-resolved modeling of surface photometric physical parameters.

Author

Comet Nuclei; Astronomical Models; Spectral Reflectance; Quantitative Analysis

20020074728 Southwest Research Inst., Boulder, CO USA

Evolving Perspectives on Space Weathering of Asteroids

Chapman, Clark R., Southwest Research Inst., USA; Solar System Remote Sensing; 2002, pp. 11-12; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Efforts to measure the colors of asteroids date back at least as far as the 1920s, when Bobrovnikoff's spectroscopy actually yielded Vesta's rotation period based on cyclical changes in its reflectance spectrum. There were several efforts in the 1940s and 1950s to compare asteroid colors with laboratory measurements of meteorite colors. They proved inconclusive for several reasons, including (a) the blandness of mineral spectra in the short-wavelength bands commonly used in astronomical photometry and (b) poor preparation of often terrestrially weathered meteorites. In the early 1970s, both laboratory measurements of properly prepared meteorite samples and astronomical observations of visible and near-IR asteroid spectra had advanced and were sufficient to address the fundamental questions concerning asteroid mineralogy and relationship to meteorites. Two basic approaches were employed: (a) attempts to assess asteroid mineralogy from first principles, based on absorption band centers for instance, and (b) spectral matching, in which it was simply assumed that if an asteroid spectrum resembled the spectrum of a particular class of meteorite it could be inferred that the two had similar mineralogy, even if the specific spectral features were not understood or were not unique.

Author

Asteroids; Space Weathering; Absorption Spectroscopy; Meteoritic Composition; Meteorite Parent Bodies

20020074729 Ithaca Coll., Dept. of Physics, Ithaca, NY USA

The Nature of Space Weathering Effects on Asteroid 433 Eros

Clark, Beth Ellen, Ithaca Coll., USA; Lucey, Paul, Hawaii Univ., USA; Helfenstein, Paul, Cornell Univ., USA; Solar System Remote Sensing; 2002, pp. 13-14; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Combined Multi-Spectral Imager (MSI) (0.95um) and Near-Infrared Spectrometer (NIS) (0.8 to 2.4 micron) observations of Psyche crater on 433 Eros are analysed to investigate the nature of space weathering effects on Eros. At 5.3 km in diameter, Psyche is one of the largest craters on Eros which exhibit distinctive brightness patterns consistent with downslope motion of dark regolith material overlying a substrate of brighter material. At spatial scales of 620 m/spectrum, Psyche crater wall materials exhibit albedo contrasts of 32-40% at 0.946 micron. Associated spectral variations occur at a much lower level of 4-8% (+/- 2-4%).

Author

Asteroids; Space Weathering; Planetary Surfaces; Planetary Craters; Spectrum Analysis; Spectral Reflectance

20020074746 Helsinki Univ. of Technology, Helsinki, Finland

Coherent Backscattering by Random Particulate Media in the Solar System

Muinonen, Karri, Helsinki Univ. of Technology, Finland; Solar System Remote Sensing; 2002, pp. 47-48; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Photometric observations for large numbers of asteroids indicate an opposition effect, a nonlinear increase of brightness at small solar phase angles, the angle between the Sun and the observer as seen from the asteroid. Vast sets of asteroid polarimetric observations show negative polarization, a peculiar degree of linear polarization (I(perpendicular) - I(parallel))/(I(perpendicular) + I(parallel)) for unpolarized incident sunlight: at small phase angles, the brightness component I(parallel) with the electric vector parallel to the scattering plane defined by the Sun, the asteroid, and the observer predominates over the perpendicular component I(perpendicular).

Author

Asteroids; Photometry; Linear Polarization

20020074748 Brown Univ., Dept. of Geological Sciences, Providence, RI USA

Small Particles and Cemented Textures: Two Challenges for Remote Compositional Analysis

Mustard, J. F., Brown Univ., USA; Solar System Remote Sensing; 2002, pp. 51-52; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Hapke's radiative transfer model for particulate surfaces has been demonstrated to be accurate for describing the reflectance of surfaces where the particles are larger than the wavelength of light (geometric optics regime). However, for particles that are smaller than the wavelength of light, the behavior of radiation in a particulate surface is different and not well described by geometric optics. Combining Mie and Hapke theories has been shown as a potentially promising avenue in modeling the reflectance of fine particle surfaces through these studies have also shown that important discrepancies between models and observations exist. Another important area of basic remote sensing research is in the changes that occur in reflectance due to

cementation. Processes that occur in soils can lead to cementation of particulates such as the formation of caliche or hardpans, or in the case of evaporite basins. Observations of the reflectance of particulate and cemented materials show that the change due to cementation are systematic and distinct from compaction or other effects, but have not been modeled. Here I describe experimental observations and modeling of these two cases (fine particles and cementation) and discuss possible paths to resolve these problems.
Author
Radiative Transfer; Geometrical Optics; Mineral Deposits; Reflectance; Cementation; Particulates

20020074752 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Groundbased Radar Investigations of Asteroids and Planetary Satellites
Ostro, S. J., Jet Propulsion Lab., California Inst. of Tech., USA; Solar System Remote Sensing; 2002, pp. 59-60; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Radar is a powerful source of information about the physical and dynamical properties of solar system bodies. Radar-detected targets include the Moon, Mercury, Mars, Venus, Phobos, Io, Europa, Ganymede, Callisto, Titan, Iapetus, Saturn's rings, eight comets, and 179 asteroids (75 main-belt and 104 near-Earth). This talk offers a perspective on the disc-integrated radar properties of solar system bodies and then turns to what radar remote sensing can tell us about asteroids using spatially-resolved measurements.
Derived from text
Radar Astronomy; Remote Sensing; Imaging Radar; Asteroids

20020074755 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Intercontinental Bistatic Radar Test Observation of Asteroid 1998 WT24
Righini, S., Consiglio Nazionale delle Ricerche, Italy; Poppi, S., Consiglio Nazionale delle Ricerche, Italy; Montebugnoli, S., Consiglio Nazionale delle Ricerche, Italy; DiMartino, M., Osservatorio Astronomico, Italy; Saba, L., Osservatorio Astronomico, Italy; Delbo, M., Osservatorio Astronomico, Italy; Ostro, S., Jet Propulsion Lab., California Inst. of Tech., USA; Monari, J., Consiglio Nazionale delle Ricerche, Italy; Poloni, M., Consiglio Nazionale delle Ricerche, Italy; Orlati, A., Consiglio Nazionale delle Ricerche, Italy; Solar System Remote Sensing; 2002, pp. 65; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

We describe the first intercontinental planetary radar test performed in Italy observing the near Earth asteroid (NEA) 33342 (1998 WT24) in December 2001 by means of the bistatic configurations Goldstone (California, USA)-Medicina (Italy) and Evpatoria (Ukraine)-Medicina. The experiment goal was to characterize the system for realtime radar follow-up observations of NEAs and artificial orbiting debris, in the framework of a feasibility study which aims at using the Sardinia Radio Telescope, at present under construction, also as a planetary radar facility. We report the preliminary results of the radar observations carried out by the IRA-CNR (Instituto di Radioastronomia - Consiglio Nazionale delle Ricerche) and the OATo (Osservatorio Astronomico di Torino) groups, aimed at exploring the scientific potentials of a new space radar program, using the existing facilities in Italy. The planetary radar technique is uniquely capable of investigating geometry and surface properties of various solar system objects, demonstrating advantages over the optical methods in its high spatial resolution and ability to obtain three-dimensional images. A single radar detection allows to obtain extremely accurate orbital elements, improving the instantaneous positional uncertainties by orders of magnitude with respect to an optically determined orbit. Radar is a powerful means to spatially resolve NEAs by measuring the distribution of the echo power in time delay (range) and Doppler frequency (line-of-sight velocity) with extreme precision in each coordinate, as it provides detailed information about the target physical properties like size, shape, rotation, near-surface bulk density and roughness and internal density distribution. The Medicina 32m antenna had been successfully used for the first time as the receiving part of a bistatic configuration during a test experiment (September 2001) held to check the capabilities of the entire data acquisition system. This test was possible thanks to the collaboration undertaken with the Evpatoria radar station, and consisted in the observation of the ETALON-1 low orbit satellite
Derived from text
Asteroids; Multistatic Radar; Radar Tracking; Radar Imagery; Radar Astronomy

20020074768 Pittsburgh Univ., Dept. of Geology and Planetary Science, Pittsburgh, PA USA
End Member Analysis of Spaceborne Thermal Infrared Data of Meteor Crater, Arizona and Application to Future Mars Data Sets
Wright, S. P., Pittsburgh Univ., USA; Ramsey, M. S., Pittsburgh Univ., USA; Solar System Remote Sensing; 2002, pp. 91-92; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Thermal infrared data from the Advanced Spaceborne and Thermal Emission and Reflection Radiometer (ASTER) is used to identify the distribution of three lithologies within the ejecta blanket of Meteor Crater, Arizona. This is possible because thermal infrared (TIR) data have been shown to add linearly and thus be easily interpretable. As all small, simple impact craters are initially created with the same morphology, this has many applications to new data from the Thermal Emission Imaging System (THEMIS) currently in orbit at Mars and will use the premise of Ramsey concerning the use of terrestrial multispectral images as proxies for thermal infrared data sets of Mars.
Author
Infrared Radiation; Meteorite Craters; Thermal Emission; Lithology

20020074770 Kharkov Astronomical Observatory, Kharkov, Ukraine
Negative Polarization of Light Scattered by Cometary Dust and Planetary Regolith: Two Different Mechanisms
Zubko, E. S., Kharkov Astronomical Observatory, Ukraine; Shkuratov, Yu. G., Kharkov Astronomical Observatory, Ukraine; Solar System Remote Sensing; 2002, pp. 95-96; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The planetary regoliths and dust of comets exhibit negative polarization branch (NPB) of light scattered at small phase angles. One can see good resemblance of NPB for such different objects; in both cases the NPB have a parabolic shape, and close values of the inversion angle (near 20 deg) and depth (near 1 percent). Thus it is reasonable to suppose that this resemblance can evidence a common origin of the dust and regolith NPB. Nevertheless, here we demonstrate that the mechanisms of NPB for comets and planetary surfaces can be quite different. In case of comets this can be due to scattering by individual particles, and for planetary regoliths this could be a combination of the ”comet” mechanism and the coherent backscatter effect.
Author
Planetary Surfaces; Regolith; Polarized Light; Scattering; Comets; Dust

20020074980 Carnegie Institution of Washington, Dept. to Terrestrial Magnetism, Washington, DC USA
Accumulation of the Planets ***Final Report, 1 Jan. 1998 - 31 Dec. 2001***
Wetherill, George W., Carnegie Institution of Washington, USA; Sep. 09, 2002; 5p; In English
Contract(s)/Grant(s): NAG5-6873; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The purpose of this project is to increase understanding of planet forming processes that are likely to have occurred in the Solar System during its early evolution. This was accomplished by development of computer models that are compatible with the present state of the Solar System as well as with observational and theoretical data attained from astrophysical observations and theory.
Author
Geophysics; Planetary Geology; Solar System; NASA Programs

20020076168 California Univ., Santa Barbara, CA USA
SB3D User Manual, Santa Barbara 3D Radiative Transfer Model
Jan. 01, 1999; 27p; In English
Report No.(s): DE2001-761461; LBNL--43439; No Copyright; Avail: Department of Energy Information Bridge

SB3D is a three-dimensional atmospheric and oceanic radiative transfer model for the Solar spectrum. The microphysics employed in the model are the same as used in the model SBDART. It is assumed that the user of SB3D is familiar with SBDART and IDL. SB3D differs from SBDART in that computations are conducted on media in three-dimensions rather than a single column (i.e. plane-parallel), and a stochastic method (Monte Carlo) is employed instead of a numerical approach (Discrete Ordinates) for estimating a solution to the radiative transfer equation. Because of these two differences between SB3D and SBDART, the input and running of SB3D is more unwieldy and requires compromises between model performance and computational expense. Hence, there is no one correct method for running the model and the user must develop a sense to the proper input and configuration of the model.
NTIS
Radiative Transfer; Stochastic Processes; Three Dimensional Models; Atmospheric Models; Ocean Models

20020076169 California Univ., Santa Barbara, CA USA
Potential Physical Processes Explaining the Observed Spectral Signature of Cloudy Column Solar Radiation Absorption
Gautier, C.; Ricchiazzi, P.; Jun. 01, 1960; 5p; In English
Report No.(s): DE2001-761458; LBNL--43439; No Copyright; Avail: Department of Energy Information Bridge

The results presented here have shown that the spectral signature of absorption in a cloudy layer could be duplicated (except for the 1.06 (micro)m region) with a rather sophisticated radiative transfer model, if the absorption by both aerosol and cloud droplets was enhanced. In the case of aerosol, highly absorbing (imaginary part of refractive index between 0.1 and 0.01), small (2 - 5 nm) particles dramatically improved the match between observations and model computations. Duplication of the observed cloud absorption required a thin layer of drizzle (large droplets). The only feature remaining unexplained at this time is the enhanced absorption at 1.06 (micro)m. These results are only based on one day of observations and need to be verified. This study suggests the need for additional co-located broadband and spectral observations in clear and cloudy sky conditions in different atmospheric regimes. In-situ aerosol and cloud droplet microphysical measurements will be crucial to unravel the role of these particles in the 'enhanced absorption' issue. Finally, accurate absorption measurements are needed at 1.06 (micro)m to understand observed absorption in that spectral region.
NTIS
Absorption Spectroscopy; Cloud Physics; Solar Radiation; Aerosols; Spectral Signatures

20020076282 Drexel Univ., Philadelphia, PA USA
Stellar and Binary Evolution in Star Clusters ***Final Report, Apr. 1998 - Mar. 2001***
McMillan, Stephen L. W., Drexel Univ., USA; [2001]; 3p; In English; AAS Meeting, Jan. 2000, Atlanta, GA, Heidelberg, USA, Germany; Sponsored by American Astronomical Society, USA
Contract(s)/Grant(s): NAG5-6964; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper presents a final report on research activities covered on Stellar and Binary Evolution in Star Clusters. Substantial progress was made in the development and dissemination of the "Starlab" software environment. Significant improvements were made to "kira," an N-body simulation program tailored to the study of dense stellar systems such as star clusters and galactic nuclei. Key advances include (1) the inclusion of stellar and binary evolution in a self-consistent manner, (2) proper treatment of the anisotropic Galactic tidal field, (3) numerous technical enhancements in the treatment of binary dynamics and interactions, and (4) full support for the special-purpose GRAPE-4 hardware, boosting the program's performance by a factor of 10-100 over the accelerated version. The data-reduction and analysis tools in Starlab were also substantially expanded. A Starlab Web site (http://www.sns.ias.edu/-starlab) was created and developed. The site contains detailed information on the structure and function of the various tools that comprise the package, as well as download information, "how to" tips and examples of common operations, demonstration programs, animations, etc. All versions of the software are freely distributed to all interested users, along with detailed installation instructions.
Derived from text
Binary Stars; Star Clusters; Stellar Evolution; Astrophysics; Software Engineering; Active Galactic Nuclei

20020076284 Arizona Univ., Steward Observatory, Tucson, AZ USA
The Physical Origin of Galaxy Morphologies and Scaling Laws ***Final Report***
Steinmetz, Matthias, Arizona Univ., USA; Navarro, Julio F., Arizona Univ., USA; [2002]; 7p; In English
Contract(s)/Grant(s): NAG5-7151; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We propose a numerical study designed to interpret the origin and evolution of galaxy properties revealed by space- and ground-based imaging and spectroscopical surveys. Our aim is to unravel the physical processes responsible for the development of different galaxy morphologies and for the establishment of scaling laws such as the Tully-Fisher relation for spirals and the Fundamental Plane of ellipticals. In particular, we plan to address the following major topics: (1) The morphology and observability of protogalaxies, and in particular the relationship between primordial galaxies and the z approximately 3 'Ly-break' systems identified in the Hubble Deep Field and in ground-based searches; (2) The origin of the disk and spheroidal components in galaxies, the timing and mode of their assembly, the corresponding evolution in galaxy morphologies and its sensitivity to cosmological parameters; (3) The origin and redshift evolution of the scaling laws that link the mass, luminosity size, stellar content, and metal abundances of galaxies of different morphological types. This investigation will use state-of-the-art N-body/gasdynamical codes to provide a spatially resolved description of the galaxy formation process in hierarchically clustering universes. Coupled with population synthesis techniques. our models can be used to provide synthetic 'observations' that can be compared directly with observations of galaxies both nearby and at cosmologically significant distances. This study will thus provide insight into the nature of protogalaxies and into the formation process of galaxies like our own Milky Way. It will also help us to assess the cosmological significance of these observations within the context of hierarchical theories of galaxy formation and will supply a theoretical context within which current and future observations can be interpreted.
Author
Galactic Evolution; Scaling Laws; Numerical Analysis; Protogalaxies; Red Shift; Morphology

20020076305 Carnegie Institution of Washington, Dept. of Terrestrial Magnetism, Washington, DC USA
Dynamical Evolution of Planetary Embryos ***Final Report, 1 Apr. 1998 - 31 Mar. 2002***
Wetherill, George W., Carnegie Institution of Washington, USA; Sep. 09, 2002; 5p; In English
Contract(s)/Grant(s): NAG5-6977; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

During the past decade, progress has been made by relating the 'standard model' for the formation of planetary systems to computational and observational advances. A significant contribution to this has been provided by this grant. The consequence of this is that the rigor of the physical modeling has improved considerably. This has identified discrepancies between the predictions of the standard model and recent observations of extrasolar planets. In some cases, the discrepancies can be resolved by recognition of the stochastic nature of the planetary formation process, leading to variations in the final state of a planetary system. In other cases, it seems more likely that there are major deficiencies in the standard model, requiring our identifying variations to the model that are not so strongly constrained to our Solar System.
Author
Extrasolar Planets; Planetary Evolution; Solar System Evolution; Astronomical Models

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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.

20020074595 NASA Ames Research Center, Moffett Field, CA USA
Robosphere1: Building A Self-Sustaining Robotic Ecology for Mars Exploration
Colombano, Silvano P., NASA Ames Research Center, USA; [2002]; 1p; In English; Mars Society Convention, 8-11 Aug. 2002, Boulder, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Robotic exploration of Mars has been a "one shot" approach where each surface mission is planned typically with a rover that will perform a series of experiments for a few weeks or months, until the robot becomes unable to operate in the harsh Mars conditions and simply "dies". It would clearly be desirable to have robots on Mars that can last for much longer periods of time, I propose that there is an approach to sustained robotic exploration that can also pave the way to future human presence. The idea is to continue building a robotic infrastructure with every mission we send. The approach is to built a team of modular robots that could repair individual members when they break down. We could "seed" areas of interest with sturdy power stations (solar, chemical) that teams of robots could use to recharge themselves. We could also seed parts and modules the robots could access for self-repair. No mission could really "fail" if we simply keep adding to and maintaining the existing infrastructure. Simply landing a package of parts will be a success. In time we create a loose infrastructure that can be controlled and augmented from earth on a continuing basis, and which could eventually pave the way for human exploration. I propose that we could begin to build this infrastructure from relatively simple modular robots. Imagine 2 "spider-like" robots built out of small modular snap-in pieces, a bin of these pieces and a bin of snap-in end effectors. One of the spiders breaks down, i.e. one of its modules needs to be replaced. The second spider comes to the rescue and helps the first one replace the broken module. Assuming the input of fresh modules, this process can continue indefinetly. Now start separating robotic explorers from robotic "mechanics", start adding, a category of mechanics that are able to fix at least some of the broken modules (and which in turn can be fixed by the original mechanics), The need for a fresh influx of modules is thus reduced. I submit that we could bootstrap a robotic ecology until it needs very little material from earth and can rely mostly on in-situ resources., We can experiment with this concept in an earthbound facility that can also simulate Mars conditions. I propose that we call this facility Robosphere1.
Author
Mars Exploration; Robotics; Robots; Ecology

20020074605 NASA Ames Research Center, Moffett Field, CA USA
Planetary Formation: From the Earth and Moon to Extrasolar Giant Planets
Lissauer, Jack J., NASA Ames Research Center, USA; [1999]; 1p; In English; Californian Institute of Technology, 24-26 Jan. 1999, Pasadena, CA, USA; Sponsored by California Inst. of Tech., USA
Contract(s)/Grant(s): RTOP 344-30-50-01; Copyright; Avail: Issuing Activity; Abstract Only

An overview of current theories of star and planet formation is presented. These models are based upon observations of the Solar System and of young stars and their environments. They predict that rocky planets should form around most single stars, although it is possible that in some cases-such planets are lost to orbital decay within the protoplanetary disk. The frequency of formation of gas giant planets is more difficult to predict theoretically. Terrestrial planets are believed to grow via pairwise

accretion until the spacing of planetary orbits becomes large enough that the configuration is stable for the age of the system. Giant planets begin their growth like terrestrial planets, but they become massive enough that they are able to accumulate substantial amounts of gas before the protoplanetary disk dissipates. Specific issues to be discussed include: (1) how large a solid core is needed to initiate rapid accumulation of gas? (2) can giant planets form very close to stars? (3) could a giant impact leading to lunar formation have occurred approx. 100 million years after the condensation of the oldest meteorites?
Author
Planetary Evolution; Extrasolar Planets; Gas Giant Planets; Terrestrial Planets

20020074614 NASA Ames Research Center, Moffett Field, CA USA
Formation of Planetary Systems
Lissauer, Jack J., NASA Ames Research Center, USA; [1999]; 1p; In English; VLT Opening Symposium, 1-4 Mar. 1999, Antofagasta, Chile
Contract(s)/Grant(s): RTOP 344-30-50-01; Copyright; Avail: Issuing Activity; Abstract Only

An overview of current theories of star and planet formation is presented. These models are based upon observations of the Solar System and of young stars and their environments. They predict that rocky planets should form around most single stars, although it is possible that in some cases such planets are lost to orbital decay within the protoplanetary disk. The frequency of formation of gas giant planets is more difficult to predict theoretically. Terrestrial planets are believed to grow via pairwise accretion until the spacing of planetary orbits becomes large enough that the configuration is stable for the age of the system. Giant planets begin their growth like terrestrial planets, but they become massive enough that they are able to accumulate substantial amounts of gas before the protoplanetary disk dissipates.
Author
Planetary Evolution; Planetary Systems; Protoplanetary Disks; Protoplanets

20020074615 NASA Ames Research Center, Moffett Field, CA USA
Formation and Detection of Planetary Systems
Lissauer, Jack J., NASA Ames Research Center, USA; [1999]; 1p; In English; American Association for the Advancement of Science Annual Meeting, 22-24 Jan. 1999, Anaheim, CA, USA; Sponsored by American Association for the Advancement of Science, USA
Contract(s)/Grant(s): RTOP 344-30-50-01; Copyright; Avail: Issuing Activity; Abstract Only

Modern theories of star and planet formation and of the orbital stability of planetary systems are described and used to discuss possible characteristics of undiscovered planetary systems. The most detailed models of planetary growth are based upon observations of planets and smaller bodies within our own Solar System and of young stars and their environments. Terrestrial planets are believed to grow via pairwise accretion until the spacing of planetary orbits becomes large enough that the configuration is stable for the age of the system. Giant planets begin their growth as do terrestrial planets, but they become massive enough that they are able to accumulate substantial amounts of gas before the protoplanetary disk dissipates. These models predict that rocky planets should form in orbit about most single stars. It is uncertain whether or not gas giant planet formation is common, because most protoplanetary disks may dissipate before solid planetary cores can grow large enough to gravitationally trap substantial quantities of gas. A potential hazard to planetary systems is radial decay of planetary orbits resulting from interactions with material within the disk. Planets more massive than Earth have the potential to decay the fastest, and may be able to sweep up smaller planets in their path. The implications of the giant planets found in recent radial velocity searches for the abundances of habitable planets are discussed, and the methods that are being used and planned for detecting and characterizing extrasolar planets are reviewed.
Author
Planetary Evolution; Planetary Systems; Planetary Orbits; Protoplanets; Extrasolar Planets

20020074653 Lunar and Planetary Inst., Houston, TX USA
The Moon Beyond 2002: Next Steps in Lunar Science and Exploration
2002; ISSN 0161-5297; 80p; In English, 12-14 Sep. 2002, Taos, NM, USA; Sponsored by Los Alamos National Lab., USA; Also announced as 20020074654 through 20020074721
Contract(s)/Grant(s): NASW-4574
Report No.(s): LPI-Contrib-1128; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This volume contains abstracts that have been accepted for presentation at the conference on The Moon Beyond 2002: Next Steps in Lunar Science and Exploration, September 12-14, 2002, in Taos, New Mexico. Administration and publications support

for this meeting were provided by the staff of the Publications and Program Services Departments at the Lunar and Planetary Institute.
Author
Conferences; Lunar Exploration; Lunar Atmosphere; Lunar Composition; Lunar Environment

20020074655 Washington Univ., Center for Astrobiology and Early Evolution, Seattle, WA USA
The Moon: A Repository for Ancient Planetary Sample
Armstrong, John C., Washington Univ., USA; Wells, Llyd, E., Washington Univ., USA; Kress, Monika, Washington Univ., USA; Gonzalez, Guillermo, Iowa State Univ. of Science and Technology, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 2; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The frequency of both lunar and Martian meteorites on the Earth indicates that the transfer of planetary material is common in the solar system. However, vigorous hydrologic or tectonic cycles, past or present, prevent most nearby planetary bodies from serving as long-term repositories of this material. The Moon is an important exception. Strategically located within the inner solar system, the Moon has theoretically collected material from all of the terrestrial planets since its formation. Lacking an atmosphere and widespread, longlasting volcanism, the Moon has potentially preserved meteorites from Mercury through the asteroid belt. While the lack of an atmosphere prevents a soft landing on the lunar surface, its low gravity means objects with small velocities with respect to the Moon will experience relatively low impact velocities. Moreover, unlike on other terrestrial planets, Martian, Venusian and Terran meteorites, blasted off their respective planets 3.9 Ga during the late heavy bombardment, should still exist on the surface of the Moon.
Author
Lunar Surface; Planetary Geology; Meteorites; Lunar Geology

20020074656 California Univ., Dept. of Earth and Space Sciences, Los Angeles, CA USA
Admittance Computations from Lunar Gravity and Topography Data
Asmar, S., California Univ., USA; Schubert, G., California Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 3; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The admittance transfer function, calculated from the gravity and topography data in the spectral domain, can be used to compute the elastic thickness of a terrestrial planet, the effective thickness of the part of the lithosphere that can support elastic stresses over long time scales. This has been applied extensively in recent years to Venus and Mars due to new datasets. The general form of the admittance at a wavenumber k where g is the gravitational acceleration at the surface, Rho(sub c) is the density of the crust, Rho(sub w) the density of the overlying fluid, Rho(sub m) the density of the upper mantle, E. Young's modulus and sigma Poisson's ratio for the elastic layer of thickness Tau(sub e), z the height of the surface where the gravity measurements are made, tau(sub c) the mean crustal thickness, alpha is the radius of the planet and Rho(sub p) its mean radius. Recent updates to the historical data set of lunar gravity from the Lunar Prospector data provides for a very rich dataset. Lunar topography from the Clementine lidar was augmented by radio occultations in the polar regions to provide a global field. In the Cartesian Admittance approach, regions of interest on the moon, such as South Pole Aitken, are identified as rectangular section for the purpose of computations based on gravity data derived from either the spherical harmonic expansion of the line-of-sight accelerations.
Author
Lunar Topography; Lunar Gravitation; Data Processing; Mathematical Models; Thickness

20020074657 Colorado School of Mines, Golden, CO USA
Sensitivity of Lunar Resource Economic Model to Lunar Ice Concentration
Blair, Brad, Colorado School of Mines, USA; Diaz, Javier, Colorado School of Mines, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 4; In English; Also announced as 20020074653
Contract(s)/Grant(s): JPL-1237006; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Lunar Prospector mission data indicates sufficient concentration of hydrogen (presumed to be in the form of water ice) to form the basis for lunar in-situ mining activities to provide a source of propellant for near-Earth and solar system transport missions. A model being developed by JPL, Colorado School of Mines, and CSP, Inc. generates the necessary conditions under which a commercial enterprise could earn a sufficient rate of return to develop and operate a LEO propellant service for government and commercial customers. A combination of Lunar-derived propellants, L-1 staging, and orbital fuel depots could

make commercial LEO/GEO development, inter-planetary missions and the human exploration and development of space more energy, cost, and mass efficient.
Author
Hydrogen; Lunar Mining; Ice; Propellants; Space Commercialization

20020074658 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA
Permanent Shadow in Lunar Simple Craters
Bussey, D. B. J., Hawaii Univ., USA; Robinson, M. S., Northwestern Univ., USA; Edwards, K., Q and D Programmers, USA; Spudis, P. D., Lunar and Planetary Inst., USA; Lucey, P. G., Hawaii Univ., USA; Steutel, D., Hawaii Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 5; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Simulation of illumination conditions for idealized simple lunar craters has increased our knowledge of the size and extent of permanently shadowed areas. We have conducted a comprehensive study of how the amount of permanent shadow in a simple crater varies as a function of crater size, location, and with season. We have used these results to determine the amount of permanent shadow, cold traps for water molecules, inside all fresh simple lunar craters between 1 and 20 km in size. These maps of permanent shadow provide more information on the locale of possible ice deposits.
Author
Lunar Craters; Lunar Shadow; Lunar Maps; Computer Aided Mapping; Computerized Simulation

20020074659 National Radio Astronomy Observatory, Socorro, NM USA
Volatiles at the Poles of the Moon
Butler, B. J., National Radio Astronomy Observatory, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 6; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Researchers in the early 1960's concluded that water ice could survive in permanently shaded regions in the lunar polar regions. Results from the Apollo missions indicated that the lunar rock and soil samples were extremely desicated, however, casting doubt on the possibility. Later studies seemed to either support the idea or not, but no conclusive evidence was found either way. In the summer of 1991, new radar maps of the surface of Mercury showed features in the polar regions which seemed to indicate the presence of large amounts of water ice, reinvigorating the discussion of water ice in the polar regions of the Moon. Recent modelling has shown that there should be sufficient supply of water to the lunar surface, that transport should be efficient enough to form the deposits, and that the temperatures are low enough to keep the water ice stable. So it certainly seems possible that water ice deposits could exist in the permanently shaded craters in the polar regions of the Moon. High resolution radar images of the lunar polar regions were obtained in May and August of 1992 to try to address this question. The Arecibo telescope was used in a manner similar to that used to obtain the Mercury images, and radar maps of the two polar regions were obtained, with a resolution of about 125 m. Detailed examination of these maps showed no regions similar to those seen on Mercury. Another result from this experiment was that it was much more likely that any such deposits, if they existed, would be located in the south polar regions rather than the north polar regions, because the amount of permanently shadowed terrain is much larger in the south than in the north. A similar conclusion was reached by examining images from the Clementine spacecraft. by combining together all of the photographs of the north and south polar regions, it could be seen which regions were never illuminated during the time in which the photos were taken. It was clear from these photos that there is much more area in the south polar region which remains in perpetual shadow than in the north polar region. Subsequent studies have confirmed and more accurately quantified this result, showing that there is about twice as much permanently shadowed terrain in the south polar regions as in the north.
Author
Lunar Surface; Ice; Water; Lunar Shadow; Polar Regions

20020074660 Image Again, Middletown, NJ USA
A New Moon: Improved Lunar Orbiter Mosaics
Byrne, Charles J., Image Again, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 7; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Photographs of the five Lunar Orbiter missions in 1965 and 1966 provide comprehensive coverage of the moon at resolutions in the range of about 1 meter to 300 meters. With a few exceptions, they are taken at a moderately low sun angle to clearly show the topography. These photos, especially the set edited by Bowker and Hughes, are still in active use in books, papers, and slide presentations and they are likely to be used in planning the missions of future lunar spacecraft. Scanning artifacts (sometimes called the 'venetian blind effect') detract from the visual quality of the photographs, particularly when they are printed at high

contrast to show albedo variations such as rays or subtle topology features such as the margins of lava flows. The author has written a program to estimate and remove the artifacts from the pictures, greatly improving their cosmetic quality. The program detects lines between framelets of a mosaic, removes the lines caused by light leaking between framelets, estimates the systematic streaks caused by cathode ray tube scanning in the spacecraft and the Ground Reconstruction Equipment, and compensates for these streaks. Non-linearity introduced by contrast enhancement in the production of the input photos is considered in the compensation process.
Author
Lunar Orbiter; Lunar Photographs; Lunar Topography; Mosaics; Restoration; Applications Programs (Computers)

20020074661 Case Western Reserve Univ., Dept. of Geological Sciences, Cleveland, OH USA
Constraining the Material that Formed the Moon: The Origin of Lunar V, CR, and MN Depletions
Chabot, N. L., Case Western Reserve Univ., USA; Agee, C. B., New Mexico Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 8; In English; Also announced as 20020074653
Contract(s)/Grant(s): NAG5-11122; RTOP 344-31-20-25; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The mantles of the Earth and Moon are similarly depleted in V, Cr, and Mn relative to chondritic values. Core formation deep within the Earth was suggested by as the origin of the depletions. Following Earth's core formation, the Moon was proposed to have inherited its mantle from the depleted mantle of the Earth by a giant impact event. This theory implied the Moon was primarily composed of material from the Earth's mantle. Recent systematic metal-silicate experiments of V, Cr, and Mn evaluated the behavior of these elements during different core formation scenarios. The study found that the V, Cr, and Mn depletions in the Earth could indeed be explained by core formation. The conditions of core formation necessary to deplete V, Cr, and Mn in the Earth's mantle were consistent with the deep magma ocean proposed to account for the Earth's mantle abundances of Ni and Co. Using the parameterizations of for the metal-silicate partition coefficients (D) of V, Cr, and Mn, we investigate here the conditions needed to match the depletions in the silicate Moon and determine if such conditions could have been present on the giant impactor.
Author
Earth Mantle; Chromium; Manganese; Vanadium; Lunar Evolution; Lunar Geology

20020074663 NASA Goddard Space Flight Center, Greenbelt, MD USA
Modeling the Stability of Volatile Deposits in Lunar Cold Traps
Crider, D. H., Catholic Univ. of America, USA; Vondrak, R. R., NASA Goddard Space Flight Center, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 10; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

There are several mechanisms acting at the cold traps that can alter the inventory of volatiles there. Primarily, the lunar surface is bombarded by meteoroids which impact, melt, process, and redistribute the regolith. Further, solar wind and magnetospheric ion fluxes are allowed limited access onto the regions in permanent shadow. Also, although cold traps are in the permanent shadow of the Sun, there is a small flux of radiation incident on the regions from interstellar sources. We investigate the effects of these space weathering processes on a deposit of volatiles in a lunar cold trap through simulations. We simulate the development of a column of material near the surface of the Moon resulting from space weathering. This simulation treats a column of material at a lunar cold trap and focuses on the hydrogen content of the column. We model space weathering processes on several time and spatial scales to simulate the constant rain of micrometeoroids as well as sporadic larger impactors occurring near the cold traps to determine the retention efficiency of the cold traps. We perform the Monte Carlo simulation over many columns of material to determine the expectation value for hydrogen content of the top few meters of soil for comparison with Lunar Prospector neutron data.
Author
Lunar Surface; Cold Traps; Space Weathering; Computerized Simulation; Hydrogen; Lunar Shadow

20020074664 Houston Univ., Inst. for Space Systems Operations, TX USA
Lunar Solar Power System and Lunar Exploration
Criswell, D. R., Houston Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 11; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Five of the six billion people on Earth produce less than $2,500 per year per person of Gross World Product (GWP). GWP growth is severely limited by the high cost, low availability and reliability, environmental damages, and political uncertainties of conventional fossil, nuclear, and terrestrial renewable power systems. In 2000 the World Energy Council challenged all decision makers to enable the equivalent of 6.7 kWt per person of thermal power within two generations. This implies 67 TWt, or approx.20

to 30 TWe, of sustainable electric power by 2050. Twenty-five power systems were reviewed to select which could: (1) sustainably provide 20 TWe to consumers; (2) profitably sell electricity for less than $0.01 per kWe-h; (3) be environmentally neutral, even nurturing; and (4) use understood technologies. The analyses indicated that only the Lunar Solar Power (LSP) System could meet these requirements within the 21st Century.
Author
Lunar Exploration; Solar Energy Conversion; Power Plants; Microwave Transmission

20020074665 Colorado School of Mines, Golden, CO USA
Human Exploration of the Moon
Duke, Michael B., Colorado School of Mines, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 12; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Earth's Moon is the only planetary body other than the Earth that has been explored directly by humans. The Apollo missions sent six crews of two astronauts to the lunar surface under conditions that were experimental, highly constrained and expensive. There are many scientific issues that would benefit from concerted human exploration that could be conducted from an outpost on the Moon. Among the interesting questions that can be posed, which have relevance for lunar and planetary origin and evolution, are: (1) How far back can impact basin stratigraphy be extended? Can pre-mare basin stratigraphy be resolved? (2) What were the processes of mare filling? How long did it take? (3) Can the early history of the sun be better determined? How far back can the history be extended? (4) Can the structure and composition of the lunar interior be determined more precisely and can better limits be placed on the timing of the Moon's geophysical evolution? (5) What are the characteristics of the permanently shadowed terrain near the lunar poles? Can their resources be developed? (6) Can the recent history of comets, asteroid and dust impact on the lunar (and therefore the Earth's) surface be established by systematic studies of impact craters at small scales?
Author
Lunar Surface; Planetary Evolution; Lunar Exploration; Lunar Maria

20020074666 Colorado School of Mines, Center for the Commercial Application of Combustion in Space, Golden, CO USA
Sample Return from South Pole-Aitken Basin
Duke, M. B., Colorado School of Mines, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 13; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The South Pole-Aitken Basin is the oldest and largest of the lunar impact basins that formed prior to 3.9 by ago. The impact may have penetrated several hundred kilometers through the crust and perhaps into an ancient mantle. The original crust was stripped off and emplaced as impact ejecta beyond the rim of the basin, while the interior of the basin was filled by subcrustal rocks, probably in the form of breccias and/or impact melts. Mare volcanism occurred locally within the Basin. The South Pole-Aitken event is significantly older than the oldest mare basalts that have been dated but it is not known whether the basin is significantly older than the front side mare basins. Several multi-ring impact basins formed within it, which redistributed rocks within the South Pole-Aitken Basin. South Pole-Aitken Basin sample return has two major objectives: (1) determine the range of rock types that were excavated by the event and what classes of subcrustal rocks were involved; (2) determine the age of the basin. A cost-constrained mission was proposed to NASA's Discovery Program in 2000 with the objective of landing at a well-chosen site and collecting about 1 kg of material, mostly fragments between 1 mm and 1 cm, by sieving up to one hundred kilograms of regolith over a six day period. A suite of fragments is anticipated that would contain primarily locally-derived rocks, with some fragments representing more distant sources. The mission fit into the scale, timing and cost constraints of the Discovery program, but was not selected for further study at that time.
Author
Sample Return Missions; Lunar Surface; Lunar Exploration; Lunar Geology; Meteorite Craters

20020074667 Virginia Univ., Lab. for Space Physics, Charlottesville, VA USA
Contribution of Ion Sputtering to the Production of Na and K in the Lunar Atmosphere
Dukes, C. A., Virginia Univ., USA; Baragiola, R. A., Virginia Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 14; In English; Also announced as 20020074653; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Neutral Na and K in the lunar atmosphere have been detected by a number of ground-based observations. to maintain their columnar densities in the Moon's tenuous exosphere, these atoms must be continually replenished by some mechanism(s). These processes include: electron-stimulated desorption, photon-stimulated desorption (primarily UV), thermal desorption, ion sputtering, and micro-meteoritic impact. We investigate the effect of solar wind bombardment on lunar-like minerals (albite,

labradorite, and anorthoclase - alkali containing feldspars similar to highland basalt), by measuring the cross section for ion-induced release of Na/K from feldspathic material. Measurements are made in an ultra-high vacuum chamber by irradiating a granular sample with 4 keV He(+) ions and measuring the surface concentration of Na/K as a function of irradiation dose with x-ray photoelectron spectroscopy (XPS). We will discuss the astronomical implications of our measurements.
Author
Sodium; Potassium; Lunar Atmosphere; Sputtering; Ions

20020074668 Los Alamos National Lab., NM USA
Remote Sensing of Titanium in Mare Balsalt Soils: Will the Real TiO2 Please Stand Up?
Elphic, R. C., Los Alamos National Lab., USA; Lawrence, D. J., Los Alamos National Lab., USA; Prettyman, T. H., Los Alamos National Lab., USA; Feldman, W. C., Los Alamos National Lab., USA; Vaniman, D. T., Los Alamos National Lab., USA; Gasnault, O., Observatoire de Midi-Pyrenees, France; Maurice, S., Observatoire de Midi-Pyrenees, France; Gillis, J. J., Washington Univ., USA; Jolliff, B. L., Washington Univ., USA; Lucey, P. G., Hawaii Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 15; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Lunar mare basalt classification schemes have relied on titanium content as a principal classifier owing to its considerable variability in returned samples. Ti is an indicator of the mineral ilmenite, a potential lunar resource and a major player in mare basalt petrogenesis. Since lunar mare basalt samples (and associated soils) come from only a few nearside sites, it is important to determine if the sample collection accurately reflects the global distribution of titanium in mare basalts. Mare basalt soils in the sample suite suggest two fundamental populations of basalts, high-Ti and low-Ti, while global estimates based on spectral reflectance techniques reveal a continuous gradation of titanium abundance. In addition, there have been disagreements between optical and nuclear remote sensing techniques used to estimate TiO2 abundance. Recent efforts to refine spectral reflectance techniques have provided better agreement with both samples and neutron-spectrometry techniques, but there are still differences in the estimates. Here we report on new results for TiO2 obtained by the Lunar Prospector Gamma Ray Spectrometer data analysis, and compare them to estimates provided by other techniques.
Author
Remote Sensing; Titanium; Lunar Surface; Lunar Resources

20020074670 NASA Johnson Space Center, Houston, TX USA
Applying Strategic Visualization(Registered Trademark) to Lunar and Planetary Mission Design
Frassanito, John R., Frassanito (John) and Associates, Inc., USA; Cooke, D. R., NASA Johnson Space Center, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 17; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

NASA teams, such as the NASA Exploration Team (NEXT), utilize advanced computational visualization processes to develop mission designs and architectures for lunar and planetary missions. One such process, Strategic Visualization (trademark), is a tool used extensively to help mission designers visualize various design alternatives and present them to other participants of their team. The participants, which may include NASA, industry, and the academic community, are distributed within a virtual network. Consequently, computer animation and other digital techniques provide an efficient means to communicate top-level technical information among team members. Today,Strategic Visualization(trademark) is used extensively both in the mission design process within the technical community, and to communicate the value of space exploration to the general public. Movies and digital images have been generated and shown on nationally broadcast television and the Internet, as well as in magazines and digital media. In our presentation will show excerpts of a computer-generated animation depicting the reference Earth/Moon L1 Libration Point Gateway architecture. The Gateway serves as a staging corridor for human expeditions to the lunar poles and other surface locations. Also shown are crew transfer systems and current reference lunar excursion vehicles as well as the Human and robotic construction of an inflatable telescope array for deployment to the Sun/Earth Libration Point.
Author
Scientific Visualization; Computerized Simulation; Mission Planning; Computer Animation; Broadcasting

20020074671 Washington Univ., Dept. of Earth and Planetary Science, Saint Louis, MO USA
An Analysis of Remotely Sensed Data of Mare Australe
Gillis, J. J., Washington Univ., USA; Jolliff, B. L., Washington Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 18; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In a continuing study of mare basalts and factors affecting their composition, volume, and eruption duration (e.g., incorporation of K-U-Th), we examine the compositions of mare basalts and nonmare units on the floor of Australe Basin. This pre-Nectarian basin is located on the southeastern limb of the Moon (52 S, 95 E), far removed from Th-enriched proximal and possible antipodal Imbrium ejecta. Australe, although one of the oldest basins, lacks younger superposed basins like those found in South Pole-Aitken Basin. Structurally, Australe exhibits two poorly preserved ring structures, an interior ring approximately 550 km and an exterior rim approximately 880 km. Lacking well-defined ring structures, the Australe Basin is most readily apparent because of its quasi-circular collection of numerous separate basalt deposits. Basalt deposits within the Australe Basin cover about one-third of the basin surface area inside the main topographic rim.
Author
Remote Sensing; Lunar Maria; Lunar Topography; Data Processing

20020074672 New Mexico Univ., Dept. of Earth and Planetary Sciences, Albuquerque, NM USA
Using Small Basaltic Lunar Clasts to Reconstruct the Early Magmatic History of the Moon
Hagerty, J. J., New Mexico Univ., USA; Shearer, C. K., New Mexico Univ., USA; Papike, J. J., New Mexico Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 19; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Intense study of lunar samples represented by the Apollo, Luna, and meteorite collections has led to a substantial understanding of the Moon's magmatic and impact history. The majority of the samples representing lunar magmatism prior to approximately 3.9 Ga, commonly occur in the form of soils or brecciated rocks, which means that these samples are essentially amalgamations of small, genetically unrelated fragments. One way to reconstruct the magmatic history represented in these samples is to resolve the compositional differences between the various fragments via microbeam techniques. The information derived from such analytical techniques can be used to decipher the chemical evolution of the Moon. For instance, the small Apollo 14 high-Al basalt fragments have been suggested to represent the earliest stages of basaltic magmatism on the Moon. Trace element information from minerals in these samples can be used to make implications for the mechanisms of formation.
Author
Chemical Evolution; Lunar Evolution; Lunar Geology; Lunar Rocks

20020074673 California Univ., Space Sciences Lab., Berkeley, CA USA
Constraints on the Origin of Lunar Crustal Magnetism
Hood, L. L., Arizona Univ., USA; Halekas, J. S., California Univ., USA; Mitchell, D. L., California Univ., USA; Lin, R. P., California Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 20; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The fundamental questions in lunar magnetism research remain much the same as they have since the Apollo days. What is the origin of the strong fields antipodal to young large impact basins? How were non-antipodal fields created? Was there ever an active lunar dynamo? How can paleointensity evidence from returned samples be reconciled with orbital magnetometer and electron reflectometer measurements? With the new data from Lunar Prospector (LP), we find ourselves in a better position to address these questions. However, many of the answers remain unclear. Data from the Apollo subsatellites showed that the largest regions of strong fields surveyed (Apollo data covers a band of about +/- 30 degrees about the equator) lay antipodal to the Orientale, Imbrium, Serenitatis, and Crisium basins. The completely global LP data set has confirmed this association, showing that the largest strongly magnetized regions on the Moon are centered antipodal to these four young large basins and roughly fill the antipodes. Furthermore, there is a slight magnetic enhancement antipodal to Nectaris, a basin just older than the other four. This fits with an overall decline in average antipodal field with increasing age. Monte Carlo simulations show that the probability of achieving such high average antipodal fields (10-40 nT) for the youngest large impact basins by chance is on the order of 10 (exp -5). It is unclear how the antipodal magnetic enhancements were produced, though the theory which states that the antipodal fields were generated by shock remanent magnetization (SRM) associated with transient antipodal amplification of ambient magnetic fields and antipodal focussing of seismic energy and/or solid ejecta, is currently the best option.
Author
Lunar Magnetic Fields; Lunar Geology; Lunar Maria; Antipodes

20020074674 National Space Development Agency, Lunar Mission Research Center, Tsukuba, Japan
Expected Data by Lunar Image/SpectroMeter (LISM)
Haruyama, J., National Space Development Agency, Japan; Ohtake, M., National Space Development Agency, Japan; Matsunaga, T., National Inst. for Environmental Studies, Japan; Hirata, N., National Space Development Agency, Japan; Demura, H., National Space Development Agency, Japan; Nakamura, R., National Space Development Agency, Japan; The Moon Beyond 2002: Next

Steps in Lunar Science and Exploration; 2002, pp. 21; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Moon is the nearest celestial body to the Earth. The Moon has keys to understand the origin and evolution of planets and their moons and our solar system. The Moon is the most important target of space explorations. Since 1960's, numerous unmanned and manned explorations have been carried out. The data by these explorations has been a huge amount and includes much information. However, there is still lack in data collected so far to understand the Moon. National Space Development Agency of Japan (NASDA) and Institute of Space and Astronautical Science (ISAS) are developing a Moon explorer the SELenological and ENgineering Explorer (SELENE) that will be launched in 2005 by an H-2A rocket. The purpose of this explorer is to accumulate data for scientific knowledge and to determine the possible availability of the Moon. Understanding the surface morphology and the surface material and its distribution of the planets and their moons is fundamental for planetary explorations. by the investigation of the Moon surface, we can presume the history of the surface and can often realize when and how the surface was formed and even internal activity of the Moon. The information of the surface is also indispensable for the future activity of human being on the Moon. Optical sensors are common and effective tools to investigate the Moon surface. We are planning to install the Lunar Imager / SpectroMeter (LISM) is a mission instrument on SELENE. The LISM consists of three subsystems: the Terrain Camera (TC), the Multiband Imager (MI) and the Spectral Profiler (SP). LISM was outlined in our past paper. We completed the LISM Prototype Model (PM) phase in 2001, and have finished the Flight Model (FM) design phase recently. We are now in FM fabrication phase. We introduce the status of LISM development and discuss the LISM FM performance in this presentation.

Author

Mission Planning; Lunar Surface; Surface Properties

20020074675 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA

Lunar Highlands Volcanism: The View from a New Millenium

Hawke, B. R., Hawaii Univ., USA; Lawrence, D. J., Los Alamos National Lab., USA; Blewett, D. T., NovSol, USA; Lucey, P. G., Hawaii Univ., USA; Smith, G. A., Hawaii Univ., USA; Taylor, G. J., Hawaii Univ., USA; Spudis, P. D., Lunar and Planetary Inst., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 22; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Since the Apollo era, the search for highlands volcanism has focused on selected light plains deposits as well as a class of spectral anomalies known as Red Spots. These spectral anomalies have spectra that are characterized by very strong ultraviolet absorptions. UV-IR color difference photographs were used to identify and characterize Red Spots on the lunar nearside. This suggested that these anomalously red areas may have compositions that are substantially different from those of typical highlands. In the immediate post-Apollo era, several workers presented evidence that at least some Red Spots were produced by highlands volcanism and suggested a connection with KREEP basalts (Medium-K Fra Mauro basalt) or even more evolved highlands compositions (e.g., High-K Fra Mauro basalt, dacite, rhyolite).

Author

Volcanology; Color Infrared Photography; Lunar Surface; Lunar Geology

20020074676 Brown Univ., Dept. of Geological Sciences, Providence, RI USA

The Moon: Keystone to Understanding Planetary Geological Processes and History

The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 23; In English; Also announced as 20020074653; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

Extensive and intensive exploration of the Earth's Moon by astronauts and an international array of automated spacecraft has provided an unequaled data set that has provided deep insight into geology, geochemistry, mineralogy, petrology, chronology, geophysics and internal structure. This level of insight is unequaled except for Earth. Analysis of these data sets over the last 35 years has proven fundamental to understanding planetary surface processes and evolution, and is essential to linking surface processes with internal and thermal evolution. Much of the understanding that we presently have of other terrestrial planets and outer planet satellites derives from the foundation of these data. On the basis of these data, the Moon is a laboratory for understanding of planetary processes and a keystone for providing evolutionary perspective. Important comparative planetology issues being addressed by lunar studies include impact cratering, magmatic activity and tectonism. Future planetary exploration plans should keep in mind the importance of further lunar exploration in continuing to build solid underpinnings in this keystone to planetary evolution. Examples of these insights and applications to other planets are cited.

Author

Lunar Exploration; Planetary Evolution; Lunar Rocks; Lunar Geology; Mission Planning

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Ages, Thicknesses and Mineralogy of Lunar Mare Basalts

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About 17% of the lunar surface are covered with lunar mare basalts. Mare basalts occur preferentially on the lunar nearside and their presence on planetary surfaces is indicative of the thermal activity and volcanic evolution of the body. In order to place constraints on the thermal/volcanic evolution and petrogenetic models for the formation of lunar mare basalts, we dated basalts exposed on the lunar nearside. Over the last 6 years we performed crater counts for Oceanus Procellarum, Mare Nubium, Cognitum, Insularum, Humorum, Imbrium, Serenitatis, Tranquillitatis, Humboldtianum, and Australe. Currently we are extending our crater counts to basalt areas in Mare Frigoris, Nectaris, Vaporum, Smythii, and Marginis. We are also in the progress of dating some lava-filled impact craters such as Schickard, Cr?ger, and Grimaldi. Crater counts not only allow one to determine the age of a basalt unit but also provide important information about the thickness, the volume, and the temporal separation of individual basalt flow units. In addition, age data in combination with Clementine and Lunar Prospector data allow one to investigate changes in mineralogy with time.

Author

Lunar Maria; Lunar Surface; Cratering; Lunar Craters

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Next Steps in Understanding Lunar Paleomagnetism and Related Issues

Hood, L. L., Arizona Univ., USA; Richmond, N. C., Arizona Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 26; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Current unresolved issues relating to the origin and interpretation of lunar paleomagnetism include: (1) the existence and size of a lunar metallic core; (2) the existence and temporal duration of a former core dynamo; (3) the role of impact plasmas in generating and/or modifying lunar magnetizing fields; (4) the origin of swirl-like albedo markings that correlate with the strongest individual orbital anomalies; and (5) the sources of magnetic anomalies on the far side in regions antipodal to major impact basins. A prerequisite for a former lunar core dynamo field is a metallic core. Conversely, if a former core dynamo is shown to be required by lunar paleomagnetic data, then the existence of a metallic core would be assured, with important implications for lunar origin and evolution models. At present, a number of geophysical constraints strongly suggest, but do not absolutely require, a metallic core with a radius in the range of 300 to 400 km. The most direct method for resolving the core issue is to analyze new seismic data such as that which may be obtained by the Lunar A mission. However, we emphasize here the possibility of analyzing orbital paleomagnetic data to investigate the existence of a former core dynamo and, indirectly, the existence of a metallic core. Specifically, modeling studies of relatively isolated orbital anomalies can yield estimates for bulk directions of magnetization for major anomaly sources. These directions of magnetization can be used to test the hypothesis that the lunar magnetizing field was dipolar and centered in the Moon, as expected for a core dynamo (issue (2) above). At the same time, inferred directions of magnetization for ejecta units such as the Cayley Formation, which are associated with a single basin-forming impact, can be used to investigate the role of impact plasmas in modifying or generating transient magnetizing fields (issue (3) above). Finally, correlative studies of orbital anomalies with surface geology can investigate the time period when lunar magnetizing fields were strongest.

Author

Lunar Magnetic Fields; Lunar Evolution; Lunar Core; Magnetic Anomalies

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Modeling the Degradation of Small Lunar Impact Craters: an Example Using a DEM (Digital Elevation Model)

Hooper, Donald M., Youngstown State Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 27; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A numerical model has been formulated to simulate the degradational evolution of lunar impact craters, specifically those with a rim-crest diameter range of 1 to 15 km. Meteoritic bombardment is generally considered to be the primary source of erosion on the lunar surface. This repetitive bombardment by small particles and secondary fragments produces individual effects that

are small compared to topographic scale and this steady erosional process modifies crater shape as a function of time. The net result of this impact erosion is a smoothing of the lunar surface in a linearly-diffusive manner of degradation.
Author
Lunar Craters; Mathematical Models; Numerical Analysis; Lunar Surface

20020074681 National Space Development Agency, Tsukuba, Japan
Global Lunar Gravity Mapping Using SELENE Sub-Satellites
Iwata, T., National Space Development Agency, Japan; Hanada, H., National Astronomical Observatory, Japan; Kawano, N., National Astronomical Observatory, Japan; Takano, T., Tokyo Univ., Japan; Namiki, N., Kyushu Univ., Japan; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 28; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The spatial distributions of the lunar gravity field have been investigated from the orbit perturbations which had been observed by two-way range and range rate (RARR) measurements for the spacecrafts in lunar orbits. The orbital determination data till Lunar Prospector have produced and improved the models of the lunar gravity field. The gravity data above the lunar far side were, however, less accurate than those above the near side, because they were observed from higher orbits or estimated from the near side data which were affected with accumulated acceleration by the far side gravity. SELENE is under development by National Space Development Agency of Japan (NASDA) and Institute of Space and Astronautical Science (ISAS), and will be launched in 2005 to elucidate lunar origin and evolution. SELENE is composed of Main Orbiter, and two micro sub-satellites; the Relay Satellite (Rstar) and the VLBI Radio Satellite (Vstar) which will be used for selenodesy experiments. Rstar and Vstar will be injected into the initial elliptical orbit of 2,400-100 km and 800-100 km in altitude, respectively. Main Orbiter will be controlled to keep the circular orbit of 100 km in altitude. These satellites will be used to obtain selenodetic data of higher accuracy by four-way Doppler measurements and differential VLBI observations.
Author (revised)
Lunar Gravitation; Orbit Perturbation; Models

20020074682 Washington Univ., Saint Louis, MO USA
Lunar Crustal and Bulk Composition: Th and Al Mass Balance
Jolliff, B. L., Washington Univ., USA; Gillis, J. J., Washington Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 29; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Global compositional remote sensing of the Moon, coupled with accurate correlation of results to Apollo and Luna samples and lunar meteorites, has led to new efforts to estimate crustal and bulk Moon compositions. Global data permit delineation of broad geochemical terranes on the Moon and extrapolation of compositions to depth on the basis of material excavated from the middle and perhaps lower crust by basin impacts. Crustal compositions inferred from surface data and mantle compositions inferred from mare basalts permit estimation of lunar bulk composition. Here, we discuss results for Th and Al, two elements that have been extracted from the mantle and concentrated strongly into the crust during global lunar differentiation. Assessment of Th content is important for determining the thermal evolution of the Moon resulting from heat of radioactive decay. Our model follows the general model described, but here we consider the implications of thinner crust, suggested by recent re-evaluation of Apollo seismic data.
Author
Lunar Composition; Lunar Evolution; Lunar Crust; Lunar Mantle; Thorium; Aluminum

20020074683 New Mexico Univ., Dept. of Earth and Planetary Sciences, Albuquerque, NM USA
Systematics of Chromium and Titanium in Olivine from Lunar Mare Basalts Compared to Basalts from the Earth and Mars
Karner, J. M., New Mexico Univ., USA; Papike, J. J., New Mexico Univ., USA; Shearer, C. K., New Mexico Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 30; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Trace element analysis of olivine from the Earth, Moon and Mars has allowed for the comparison of planetary basalts at a mineralogical scale. We continue this approach by exploring the behavior of Cr and Ti in planetary olivine, relating the similarities and differences in element partitioning to planetary basalt origin, setting, and process.
Author
Olivine; Lunar Maria; Basalt; Planetary Geology; Chemical Analysis; Chromium; Titanium

20020074684 Washington Univ., Dept. of Earth and Planetary Sciences, Saint Louis, MO USA

On the Age of the Nectaris Basin

Korotev, R. L., Washington Univ., USA; Gillis, J. J., Washington Univ., USA; Haskin, L. A., Washington Univ., USA; Jolliff, B. J., Washington Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 31; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We do not know which, if any, rocks of the Apollo collection record the age of the Nectaris impact. However, the age of Nectaris is generally accepted to be 3.92 Gyr on the basis of the careful analysis of breccia ages. In essence, the argument is based on the following observations and assumptions, among others. of the Apollo sites, Apollo 16 lies closest to the Nectaris basin, but Imbrium is bigger and its deposits overlie some Nectaris deposits because it's older. Nevertheless, from ejecta deposit modeling, it would predate Imbrium. Granulitic breccias are common at the site. Although it is not known in which basin or crater they formed, they are not likely products of the Imbrium impact, and their measured ages would not likely be affected by the Imbrium impact. They are also not likely products of post-Nectarian, pre-Imbrian impacts that formed local craters. Their ages, therefore, provide an upper limit to the Nectaris age. Most granulitic breccias, and most materials of the Apollo 16 site, have 3.9 Gyr ages, so this age likely corresponds to a basin, probably Nectaris. We review some recent data, observations, hypotheses, models, and opinions.

Author

Lunar Maria; Lunar Craters; Ejecta; Geochronology

20020074685 Los Alamos National Lab., NM USA

Identifying Locations for Future Lunar Sample Missions

Lawrence, D. J., Los Alamos National Lab., USA; Elphic, R. C., Los Alamos National Lab., USA; Feldman, W. C., Los Alamos National Lab., USA; Gasnault, O., Observatoire de Midi-Pyrenees, France; Prettman, T. H., Los Alamos National Lab., USA; Vaniman, D. T., Los Alamos National Lab., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 32; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

With global composition data in hand from the Clementine [1] and Lunar Prospector (LP) missions, one of the goals for using these data is to delineate the full range of lunar elemental and compositions. Based on samples, our knowledge of lunar compositions is limited in a number of ways. For the Apollo and Luna missions, we only have samples from nine different locations. Most of these locations are situated in or near the Th-rich PKT. The range of known lunar compositions is extended by lunar meteorites, which include samples from regions such as the unsampled lunar highlands and unsampled mare basalt regions. However, information from lunar meteorites is limited because the exact provenance of these samples is unknown. A goal for future lunar missions will be to return samples from or study in situ previously unsampled regions. While many criteria will be used to select such locations (e.g., age of region, terrane location, geologic complexity, ease of accessibility), one criteria that should also be considered is composition.

Author

Lunar Maria; Lunar Geology; Lunar Resources; Mission Planning; Meteorites; Lunar Exploration

20020074686 Los Alamos National Lab., NM USA

Lunar Surface Outgassing and Alpha Particle Measurements

Lawson, S. L., Los Alamos National Lab., USA; Feldman, W. C., Los Alamos National Lab., USA; Lawrence, D. J., Los Alamos National Lab., USA; Moore, K. R., Los Alamos National Lab., USA; Elphic, R. C., Los Alamos National Lab., USA; Maurice, S., Observatoire de Midi-Pyrenees, France; Belian, R. D., Los Alamos National Lab., USA; Binder, A. B., Arizona Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 33; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Lunar Prospector Alpha Particle Spectrometer (LP APS) searched for lunar surface gas release events and mapped their distribution by detecting alpha particles produced by the decay of gaseous radon-222 (5.5 MeV, 3.8 day half-life), solid polonium-218 (6.0 MeV, 3 minute half-life), and solid polonium-210 (5.3 MeV, 138 day half-life, but held up in production by the 21 year half-life of lead-210). These three nuclides are radioactive daughters from the decay of uranium-238. Radon reaches the lunar surface either at areas of high soil porosity or where fissures release the trapped gases in which radon is entrained. Once released, the radon spreads out by "bouncing" across the surface on ballistic trajectories in a randomwalk process. The half-life of radon-222 allows the gas to spread out by several 100 km before it decays (depositing approximately half of the polonium-218 recoil nuclides on the lunar surface) and allows the APS to detect gas release events up to several days after they occur. The long residence time of the lead-210 precursor to polonium-210 allows the mapping of gas vents which have been active over the last

approximately 60 years. Because radon and polonium are daughter products of the decay of uranium, the background level of alpha particle activity is a function of the lunar crustal uranium distribution.
Author
Alpha Particles; Lunar Surface; Outgassing; Radioactive Isotopes; Radioactive Decay

20020074687 Los Alamos National Lab., Luminescence Geochronology Lab., NM USA
Anomalous Fading of Stimulated Luminescence (TL/OSL): Comparisons Between Lunar Materials and the LSC Mars-1 Simulant
Lepper, K., Los Alamos National Lab., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 34; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Thermoluminescence (TL) from silicate minerals has been used by planetary geoscientists to investigate a variety of topics such as: transient lunar phenomena, lunar heat flow characteristics, space radiation exposure and thermal history of meteorites, and terrestrial residence time of meteorites. Recently an advanced related technique, optically stimulated luminescence (OSL), has been proposed as an age-dating method for sedimentary deposits on Mars. Dating applications of TL and OSL can be complicated by a property, notably present in feldspars, known as anomalous fading. A functional definition of anomalous fading is a loss of charge from thermally stable defect sites via athermal mechanisms, resulting in a decrease in dose-related luminescence over time.
Author
Time Measurement; Mars Surface; Fading; Lunar Rocks

20020074688 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA
Polar Night: A Mission to the Lunar Poles
Lucey, P. G., Hawaii Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 35; In English; Also announced as 20020074653; No Copyright; Abstract Only; Available from CASI only as part of the entire parent document

The Discovery Program, through measurements by the Lunar Prospector spacecraft, established that the volatile element hydrogen is enriched in the lunar polar regions. It is virtually certain that this enrichment is due to cold trapping of hydrogen in one or more chemical states owing to the low temperatures of obliquely illuminated and permanently shadowed regions near the Moon's poles. This measurement confirms suggestions that the lunar (and mercurian) polar regions can capture and retain volatiles that encounter these surfaces. Modeling of lunar polar temperatures has indicated that water ice at shallow depths can persist for geologic time, even at high latitude regions which are not permanently shaded. Modeling of permanently shadowed craters indicates that temperatures in the shallow subsurface are low enough, as low as 40 kelvins, to retain for geologic time extremely volatile ices including carbon dioxide, methane, ammonia, sulfur dioxide. These model temperatures are also low enough retain a host of low molecular weight organic compounds. Modeling of the Moon's obliquity over time indicates that permanently shaded regions can have persisted for 2.5 BY, exposing them to a host of potential sources of volatiles. The confirmed existence of lunar cold traps raises the possibility that the lunar poles have trapped and retained volatile materials from sources which are central to many aspects of NASA's strategic plans. These sources include comets, asteroids, interplanetary dust particles, interstellar molecular clouds, the solar wind, and lunar volcanic and radiogenic gases. The Polar Night mission will conduct an inventory of volatiles and provide sufficient analysis to determine or greatly constrain the sources of polar volatiles and their nature. Polar Night will determine the chemical composition, abundance and deuterium to hydrogen ratio of volatiles cold-trapped in permanently shadowed regions of the lunar poles. These measurements will be conducted in situ using mass spectrometers, and neutron spectrometers deployed on six penetrator hard landers. The landing sites of the penetrators will be selected using remote measurements of the temperature, H-abundance at high resolution, and radar polarization properties measured from orbit during a six month remote sensing campaign.
Author
Hydrogen; Cold Traps; Lunar Environment; Lunar Shadow; Lunar Temperature; Ice

20020074689 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA
A Complete First Order Model of the Near-Infrared Spectral Reflectance of the Moon
Lucey, P. G., Hawaii Univ., USA; Steutel, D., Hawaii Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 36; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The spectral reflectance properties of the Moon are governed by the minerals and glasses composing the lunar regolith, their physical state, and the optical effects of soil maturity. Work has provided all the tools necessary to produce a model of near-IR spectra of the Moon within simplifying assumptions. We have produced such a model and are beginning to apply it to lunar science

problems. Two classes of problems are amenable to immediate use: determining compositions of lunar surface regions using groundbased and Clementine data, and understanding the detection limits for minerals and rock types using existing and planned data sets.
Author
Spectral Reflectance; Moon; Near Infrared Radiation; Models; Lunar Surface; Lunar Composition

20020074690 California Univ., Space Sciences Lab., Berkeley, CA USA
Search for Correlations Between Crustal Magnetic Fields and Other Lunar Properties
Mitchell, D. L., California Univ., USA; Halekas, J. S., California Univ., USA; Lin, R. P., California Univ., USA; Frey, S., California Univ., USA; Hood, L. L., Arizona Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 37; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The correlation of surface magnetic fields with other known properties of the Moon can provide clues to the origin of the magnetization. In principle, crustal magnetization can exist anywhere from the surface down to the Curie isotherm (770 C for iron), which is at least several tens of kilometers beneath the surface. Thus, we must search for correlations of the magnetic field with both surface and subsurface properties. The significance of any statistical analysis depends on the amount of data available. The sparse electron reflection data from the Apollo program, which was confined within approximately 35 degrees of the lunar equator and undersampled by a factor of approximately 100, made statistical analysis difficult. With the exception of a linear magnetic feature that follows Rima Sirsalis and a tendency for strong anomalies to occur in association with unusual albedo markings of the Reiner Gamma class, no clear-cut association of surface magnetic fields with surface selenological features was found. Lunar Prospector MAG/ER data provide global coverage and improve the sampling of the surface magnetic field by more than an order of magnitude. The power of this new data set was demonstrated in a study of the magnetic properties of lunar nearside geologic units, which clearly showed that Cayley deposits are associated with magnetic anomalies. Another correlation appears to exist between the surface magnetic field and thorium concentration in the region antipodal to the Imbrium basin. Both of these correlations suggest that ejecta from the Imbium impact may be a significant source of anomalies.
Author
Lunar Magnetic Fields; Lunar Crust; Lunar Environment; Magnetic Anomalies; Lunar Craters

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Mission Outline of Lunar-A
Mizutani, H., Institute of Space and Astronautical Science, Japan; Fujimura, A., Institute of Space and Astronautical Science, Japan; Tanaka, S., Institute of Space and Astronautical Science, Japan; Shiraishi, H., Institute of Space and Astronautical Science, Japan; Yoshida, S., Institute of Space and Astronautical Science, Japan; Nakajima, T., Institute of Space and Astronautical Science, Japan; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 38; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Lunar-A mission of ISAS, Japan, will be launched in 2003 from Kagoshima Space Center using M-V launch vehicle. In this mission, two penetrators will be deployed on the near-side and the far-side of the Moon. Each penetrator contains an accelerometer, temperature sensors, thermal conductivity probes and two short-period seismometers. The seismological and heat flow data obtained by those instruments within the penetrator are first transmitted to a spacecraft orbiting at 200 km altitude and then sent back to the ground stations. The life time of the penetrator is estimated to be about one year. The seismic study will be made by observing various deep moonquakes at two widely-spaced stations. Observations of the amplitude and travel times of near-side deep moonquake event at the far-side stations offer a unique opportunity to prove or disprove the existence of a lunar core and to obtain information about its size and physical property. Data on the core size and its property are crucial to understand the bulk abundance of the siderophile elements. On the other hand, heat flow data at two sites will provide much better basis of estimating globally averaged heat flow value, which allow us to estimate the bulk abundance of refractory elements. Those cosmochemical signature derived from the penetrator experiment is essential for understanding the origin of the Moon.
Author
Mission Planning; Lunar Core; Moonquakes; Lunar Evolution; Heat Transmission

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Scientific Research in SELENE Mission

Mizutani, H., Institute of Space and Astronautical Science, Japan; Sasaki, S., Institute of Space and Astronautical Science, Japan; Iijima, Y., Institute of Space and Astronautical Science, Japan; Tanaka, K., Institute of Space and Astronautical Science, Japan; Kato, M., Institute of Space and Astronautical Science, Japan; Takizawa, Y., National Space Development Agency, Japan; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 39; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

SELENE(Selenological and Engineering Explorer) mission is planned in 2005 for lunar science and technology development. The mission will consist of a main orbiting satellite at about 100 km altitude in the polar circular orbit and two subsatellites in the elliptical orbits with apolune at 2,400 km and 800 km. The orbiter will carry instruments for scientific investigation including mapping of lunar topography and surface composition, measurement of the magnetic fields, and observation of lunar and solar-terrestrial plasma environment. The primary objective of the SELENE mission is to study the origin and evolution of the Moon by global mapping from the polar orbit at 100 km altitude.

Author

Lunar Topography; Lunar Maps; Lunar Environment; Lunar Evolution; Mission Planning

20020074693 Notre Dame Univ., Dept. of Civil Engineering and Geological Sciences, IN USA

Using the New Views of the Moon Initiative to Define Future Missions: The Lunar Seismic Network

Neal, C. R., Notre Dame Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 40; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The New Views of the Moon initiative is unprecedented in the history of lunar research because it has integrated remotely sensed and sample data in its approach to synthesizing lunar research over the last 30+ years. The integration of remotely sensed and sample data has clearly demonstrated what we know and, maybe more importantly, what we don't know about the Moon. Most significantly, it has helped to crystallize fundamental scientific questions that still need to be addressed and lessons learned from our study of the Moon and provides an invaluable road map for our exploration of the inner planets. The results of the New Views initiative highlight in explicit detail just how little we know about the nature of the lunar interior. While innovative modeling approaches have refined the original data, comprehensive and definitive interpretations of the lunar mantle remain elusive and fundamental questions regarding lunar origin, evolution, and structure remain unanswered. These include: What is the structure and thickness of the crust on the lunar near and far sides? Are crustal structure changes gradational or are distinct domains present? Is the approximately 500 km discontinuity a moon-wide phenomenon (magmasphere vs. magma ocean)? Do seismic data in the middle and deep lunar mantle define a unique garnet signature? What is the lunar core made of and how extensive is it? Are the core and mantle completely solid or do plastic zones still persist? Are nests producing Moon-quakes present on the far side?

Author

Lunar Core; Lunar Evolution; Lunar Mantle; Mission Planning

20020074695 NASA Johnson Space Center, Houston, TX USA

Crystallization Age and Impact Resetting of Ancient Lunar Crust from the Descartes Terrane

Norman, M. D., Australian National Univ., Australia; Borg, L. E., New Mexico Univ., USA; Nyquist, L. E., NASA Johnson Space Center, USA; Bogard, D. D., NASA Johnson Space Center, USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 42; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Lunar ferroan anorthosites (FANs) are relics of an ancient, primary feldspathic crust that is widely believed to have crystallized from a global magma ocean. Compositions and ages of FANs provide fundamental information about the origin and magmatic evolution of the Moon, while the petrology and thermal history of lunar FANs illustrate the structure and impact history of the lunar crust. Here we report petrologic, geochemical, and isotopic (Nd-SR-Ar) studies of a ferroan noritic anorthosite clast from lunar breccia 67215 to improve our understanding of the composition, age, and thermal history of the Moon.

Author

Crystallization; Lunar Crust; Lunar Evolution; Geochemistry; Lunar Rocks; Breccia

20020074697 National Space Development Agency, Lunar Mission Research Center, Tsukuba, Japan

Capability and Data Analysis of the Multiband Imager for the SELENE Mission

Ohtake, M., National Space Development Agency, Japan; Demura, H., National Space Development Agency, Japan; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 44; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Lunar Imager/SpectroMeter (LISM) is an instrument being developed for the SELENE project that will be launched in 2005. LISM consists of the three subsystems, the Terrain Camera (TC), Multiband Imager (MI), and Spectral Profiler (SP). Those systems share some components and electronics. MI is a high-resolution multiband imaging camera consisting of two visible and near infrared sensors.
Author
Spectrometers; High Resolution; Lunar Surface; Minerals; Spatial Distribution; Lunar Crust

20020074698 Joint Inst. for Nuclear Research, Dubna, USSR
On Search and Identification of Super Heavy (Z = 110 - 114) and Super Super Heavy (Z Greater Than or Equal to 160) Cosmic Ray Nuclei Tracks in the Moon Olivine Crystals
Perelygin, V. P., Joint Inst. for Nuclear Research, USSR; Abdullaev, I. G., Joint Inst. for Nuclear Research, USSR; Bondar, Y. V., Institute of Environmental Geochemistry, Ukraine; Chuburkov, Y. T., Joint Inst. for Nuclear Research, USSR; Fleischer, R. L., Rensselaer Polytechnic Inst., USA; Kravets, L. I., Joint Inst. for Nuclear Research, USSR; Kashkarov, L. L., Joint Inst. for Nuclear Research, USSR; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 45; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The main goal of the present work is the search and possible identification of relatively stable nuclei of Super Heavy (Z=110 - 114)(SHE) and Super Super Heavy (Z= 160) elements (SSHE) in Galactic cosmic rays, basing on the fossil track studies of the olivine crystals from the Moon surface. Nuclei of the elements with Z more than or equal to 30 up to Th - U and Z = 110-160 are most probably the products of Supernova explosion when freshly formed neutron star matter erupted outside (about 10% of its final mass). That neutron matter supposed to be then degraded. It is thought to be the main source of all the heaviest element in the Galaxy. The strong nonpermanent electromagnetic fields of exploding star can provide the acceleration of these freshly formed nuclei up to energies 10 (exp 6) MeV per nuclon.
Author
Cosmic Rays; Nuclei; Olivine; Lunar Surface

20020074699 Hawaii Univ., Hawaii Inst. of Geophysical and Planetology, Honolulu, HI USA
Compositional Units on the Moon: The Role of South Pole-Aitken Basin
Peterson, C. A., Hawaii Univ., USA; Hawke, B. R., Hawaii Univ., USA; Blewett, D. T., Hawaii Univ., USA; Bussey, D. B. J., Hawaii Univ., USA; Lucey, P. G., Hawaii Univ., USA; Taylor, G. J., Hawaii Univ., USA; Spudis, P. D., Lunar and Planetary Inst., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 46; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Many of the large-scale geochemical provinces found on the Moon today are strongly linked to the impact that created South Pole-Aitken (SPA) basin. This basin has a topographic rim about 2500 km in diameter, an inner shelf 400 - 600 km in width, and an irregular depressed floor at an elevation about 12 km below the rim crest. Topographically high regions surround the SPA basin and are especially pronounced to the north and east; models also show very high levels of crustal thickness in those areas and relatively thin crust beneath the basin. Multispectral images of the Moon were returned by the Galileo and Clementine spacecraft. An enhancement in mafic materials in the SPA interior was noted. Methods were derived that use Clementine UVVIS data to quantify the iron and titanium content of lunar surface materials and, in addition to confirming the enhanced FeO content in the basin interior, noted that regions in the far northern farside are extremely low in FeO. This indicates extensive exposures of anorthosite. More recently, the Lunar Prospector spacecraft returned GRS data that are being used to produce elemental abundance maps. Preliminary thorium maps have been produced, and iron maps are also being produced using techniques totally independent from those used with the Clementine data.
Author
Lunar Surface; Lunar Craters; Mineralogy; Geochemistry; Lunar Maps

20020074700 Brown Univ., Dept. of Geological Sciences, Providence, RI USA
Reconstructing the Stratigraphy of the Ancient South Pole-Aitken Basin Interior
Petro, N. E., Brown Univ., USA; Pieters, C. M., Brown Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 47; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The South Pole-Aitken (SPA) basin is possibly the largest, oldest basin on the Moon. Since its formation the basin has undergone extensive modification events due largely to impacts and the limited emplacement of mare basalts. Nevertheless, albedo and geochemical data from Clementine and Lunar Prospector strongly suggest that the SPA interior contains distinct materials, which, due to the size of the basin, may be deep-seated in origin. Clearly, large and small craters have reworked materials

within the basin and an unknown amount of exterior material has been transported into the basin. to confidently identify any material as representing deep-seated products requires an evaluation of the approximately 4Ga impact and resurfacing record. In order to identify likely components of the original SPA melt breccia and/or deep-seated material requires recognizing areas that have undergone minimum reprocessing by large craters, basins, and volcanism and the ability to reconstruct local stratigraphy. Author

Lunar Surface; Lunar Craters; Lunar Maps; Lunar Maria; Meteorite Collisions; Stratigraphy; Lunar Rocks

20020074702 Los Alamos National Lab., NM USA

Classification of Regolith Materials from Lunar Prospector Data Reveals a Magnesium-Rich Highland Province

Prettyman, T. H., Los Alamos National Lab., USA; Lawrence, D. J., Los Alamos National Lab., USA; Vaniman, D. T., Los Alamos National Lab., USA; Elphic, R. C., Los Alamos National Lab., USA; Feldman, W. C., Los Alamos National Lab., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 49; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Lunar Prospector (LP) mission returned the first global elemental maps of major elements O, Si, Al, Ti, Fe, Mg, and Ca. The maps were submitted to the Planetary Data System (PDS) archive in June of 2002. Maps are provided for all of the elements at 5 spatial resolution, corresponding to 1790 equal area pixels. This resolution is sufficient to investigate large-scale compositional variations within major lunar terranes. Further work is underway to develop 2 and 0.5 maps for a subset of these elements, which will reduce the effects of instrumental mixing and will enable more meaningful comparisons to the sample collection. We believe that we have discovered a highland province that may contain an abundance of Mg-rich troctolitic or noritic materials. We are investigating several possibilities for the origin of this province, one of which is the exceptional abundance of late-stage Mgsuite intrusions at a high level in the lunar crust. We will use the entire Lunar Prospector elemental data set to investigate candidate hypotheses.

Author

Lunar Maps; Mineralogy; Magnesium; Lunar Geology; Lunar Resources; Lunar Crust; Lunar Rocks

20020074703 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA

Did the Moon Come from the Impactor? Siderophile Element Constraints

Righter, K., Arizona Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 50; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The issue of whether the Moon has a small metallic core is re-examined in light of new information: improved dynamical modelling, new geophysical constraints on core size, and high temperature and pressure metal-silicate partition coefficients. Although the Moon has similar Co and W depletions to the Earth, it has distinctly different Ni, Mo, Re, P and Ga depletions, consistent with the presence of a small metallic core. Because impact modelling predicts the Moon is made of mantle material primarily from the impactor, bulk Moon compositions are considered from 'hot', 'warm' and 'cool' impactors and proto- Earths (deep, intermediate, and shallow melting, respectively). If the Moon is made of mantle material from either a 'hot' impactor or a 'warm' impactor or proto-Earth, a small metallic core (0.7 to 2 percent) is predicted. If the Moon is made from mantle material from a 'hot' proto-Earth, the lunar mantle would be more depleted in W or P than is observed. Some have argued recently that the Moon has no metallic core; scenarios in which the Moon is made from impactor mantle material and has no core predict larger depletions of Ga, Co and W than are observed. Consistency of siderophile element concentrations in the lunar mantle with an impactor bulk Moon composition eliminate previous geochemical objections to an impactor origin of the Moon. Depletions of slightly (Mn, V and Cr) and highly (Re, Au, PGE's) siderophile elements in the lunar mantle will also be considered.

Author

Lunar Mantle; Lunar Core; Lunar Composition; Impactors

20020074704 Northwestern Univ., Evanston, IL USA

Topographic-Photometric Corrections Applied to Clementine Spectral Reflectance Data of the Apollo 17 Region

Robinson, M. S., Northwestern Univ., USA; Jolliff, B. L., Washington Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 51; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Recently, great strides have been made in understanding the origin and evolution of the Moon through a synthesis of Apollo sample analyses, Clementine Spectral Reflectance (CSR) data, and Lunar Prospector remotely sensed geochemical data. These studies have generally investigated regional chemical and mineralogical variations at the scale of tens to hundreds of km. More detailed studies at the sub-kilometer scale utilizing derived spectral parameters such as FeO and TiO2 are hampered by inaccuracies in photometric corrections resulting from local slopes. Detailed analysis of spectral parameters of lunar highlands

and craters requires topographic data at a scale comparable to the pixel resolution of the spectral measurements, for CSR approximately 125-250 m/p. Unfortunately global topographic data for the Moon exist only at the scale of tens of kilometers.
Author
Mineralogy; Lunar Topography; Lunar Maps; Spectrum Analysis; Titanium Oxides; Iron Oxides

20020074705 NASA Goddard Space Flight Center, Greenbelt, MD USA
Lunar Radar Cross Section at Low Frequency
Rodriguez, P., Naval Research Lab., USA; Kennedy, E. J., Naval Research Lab., USA; Kossey, P., Air Force Research Lab., USA; McCarrick, M., Advanced Power Technologies, Inc., USA; Kaiser, M. L., NASA Goddard Space Flight Center, USA; Bougeret, J.-L., Observatoire de Paris-Meudon, France; Tokarev, Y. V., Radiophysical Research Inst., Russia; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 52; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Recent bistatic measurements of the lunar radar cross-section have extended the spectrum to long radio wavelength. We have utilized the HF Active Auroral Research Program (HAARP) radar facility near Gakona, Alaska to transmit high power pulses at 8.075 MHz to the Moon; the echo pulses were received onboard the NASA/WIND spacecraft by the WAVES HF receiver. This lunar radar experiment follows our previous use of earth-based HF radar with satellites to conduct space experiments. The spacecraft was approaching the Moon for a scheduled orbit perturbation when our experiment of 13 September 2001 was conducted. During the two-hour experiment, the radial distance of the satellite from the Moon varied from 28 to 24 Rm, where Rm is in lunar radii.
Author
Radar Cross Sections; Lunar Radar Echoes; Long Wave Radiation; Lunar Surface

20020074706 NASA Ames Research Center, Moffett Field, CA USA
A Miniature Mineralogical Instrument for In-Situ Characterization of Ices and Hydrous Minerals at the Lunar Poles
Sarrazin, P., NASA Ames Research Center, USA; Blake, D., NASA Ames Research Center, USA; Vaniman, D., Los Alamos National Lab., USA; Bish, D., Los Alamos National Lab., USA; Chipera, S., Los Alamos National Lab., USA; Collins, S. A., Jet Propulsion Lab., California Inst. of Tech., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 53; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Lunar missions over the past few years have provided new evidence that water may be present at the lunar poles in the form of cold-trapped ice deposits, thereby rekindling interest in sampling the polar regions. Robotic landers fitted with mineralogical instrumentation for in-situ analyses could provide unequivocal answers on the presence of crystalline water ice and/or hydrous minerals at the lunar poles. Data from Lunar Prospector suggest that any surface exploration of the lunar poles should include the capability to drill to depths of more than 40 cm. Limited data on the lunar geotherm indicate temperatures of approximately 245-255 K at regolith depths of 40 cm, within a range where water may exist in the liquid state as brine. A relevant terrestrial analog occurs in Antarctica, where the zeolite mineral chabazite has been found at the boundary between ice-free and ice-cemented regolith horizons, and precipitation from a regolith brine is indicated. Soluble halogens and sulfur in the lunar regolith could provide comparable brine chemistry in an analogous setting. Regolith samples collected by a drilling device could be readily analyzed by CheMin, a mineralogical instrument that combines X-ray diffraction (XRD) and X-ray fluorescence (XRF) techniques to simultaneously characterize the chemical and mineralogical compositions of granular or powdered samples. CheMin can unambiguously determine not only the presence of hydrous alteration phases such as clays or zeolites, but it can also identify the structural variants or types of clay or zeolite present (e.g., well-ordered versus poorly ordered smectite; chabazite versus phillipsite). In addition, CheMin can readily measure the abundances of key elements that may occur in lunar minerals (Na, Mg, Al, Si, K, Ca, Fe) as well as the likely constituents of lunar brines (F, Cl, S). Finally, if coring and analysis are done during the lunar night or in permanent shadow, CheMin can provide information on the chemistry and structure of any crystalline ices that might occur in the regolith samples.
Author
Lunar Surface; Lunar Resources; Ice; Robotics; Sampling; Mineralogy; Samplers

20020074707 New Mexico Univ., Inst. of Meteoritics, Albuquerque, NM USA
Future Lunar Sampling Missions: Big Returns on Small Samples
Shearer, C. K., New Mexico Univ., USA; Borg, L., New Mexico Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 54; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The next sampling missions to the Moon will result in the return of sample mass (100g to 1 kg) substantially smaller than those returned by the Apollo missions (380 kg). Lunar samples to be returned by these missions are vital for: (1) calibrating the late impact history of the inner solar system that can then be extended to other planetary surfaces; (2) deciphering the effects of catastrophic impacts on a planetary body (i.e. Aitken crater); (3) understanding the very late-stage thermal and magmatic evolution of a cooling planet; (4) exploring the interior of a planet; and (5) examining volatile reservoirs and transport on an airless planetary body. Can small lunar samples be used to answer these and other pressing questions concerning important solar system processes? Two potential problems with small, robotically collected samples are placing them in a geologic context and extracting robust planetary information. Although geologic context will always be a potential problem with any planetary sample, new lunar samples can be placed within the context of the important Apollo - Luna collections and the burgeoning planet-scale data sets for the lunar surface and interior. Here we illustrate the usefulness of applying both new or refined analytical approaches in deciphering information locked in small lunar samples.
Author
Sampling; Lunar Rocks; Lunar Surface; Lunar Geology

20020074709 California Univ., Dept. of Earth and Planetary Science, Berkeley, CA USA
Lunar Core Dynamo Driven by Thermochemical Mantle Convection
Stegman, D. R., California Univ., USA; Jellinek, A. M., California Univ., USA; Zatman, S. A., Washington Univ., USA; Baumgardner, J. R., Los Alamos National Lab., USA; Richards, M. A., California Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 57; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Moon presently has no internally generated magnetic field (i.e. core dynamo). However, an outstanding question resulting from the Apollo sample return missions is the possible existence of a lunar dynamo early in the Moon's history. Paleomagnetic data combined with radiometric ages obtained from lunar samples suggest the existence of a magnetic field from approximately 3.9-3.6 Ga (possibly beginning earlier), likely of comparable intensity as the Earth's present-day field. The implied existence of a lunar dynamo at least 500 Myr after the Moon's formation is difficult to explain. Assuming that a dynamo is driven by thermal convection in the core, the existence and duration of a dynamo correspond to periods when core heat flux exceeds the adiabatic heat flux (Q(sub cmb)) is greater than Q(sub ad). Since simple thermal evolution models for the Moon yield insufficient core heat flux to power a dynamo at such times, we explore alternative thermal evolutions.
Author
Lunar Core; Dynamo Theory; Lunar Evolution; Models; Thermochemistry

20020074710 Lunar and Planetary Inst., Houston, TX USA
Searching for Antipodal Basin Ejecta on the Moon
Spudis, Paul D., Lunar and Planetary Inst., USA; Fessler, Brian, Lunar and Planetary Inst., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 56; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Multi-ring basins are the largest impact events in lunar history and have catastrophic, global effects on the Moon. Ejecta from these events may travel over great distances, but the thickness of the ensuing debris blanket thins quickly as one goes away from the basin rim. Because impact events tend to (more or less) eject material equidistant from the point of impact, distal ejecta converge from all directions at the basin antipodes, possibly resulting in an anomalously large accumulation of ejecta at that point. Antipodal concentrations of ejecta may have resulted in both anomalous compositional and geophysical relations seen in some regions of the Moon. This hypothesis has recently been revived, with the specific proposal that anomalously high contents of Th found near the far side crater Van De Graaf are concentrations of Imbrium basin ejecta, antipodal to that impact feature. We have previously described techniques designed to map rock units on the Moon using Clementine and LP elemental data. These maps show how compositions vary regionally and allow us to directly compare regions distant from each other. We have used the petrologic maps to address the question of recognizable antipodal deposits of basin ejecta.
Author
Structural Basins; Lunar Surface; Lunar Maria; Ejecta; Lunar Maps

20020074711 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA
Efficient Material Mapping Using Clementine Multispectral Data
Steutel, D., Hawaii Univ., USA; Lucey, P. G., Hawaii Univ., USA; Winter, M. E., Hawaii Univ., USA; LeMouelic, S., Paris-Sud Univ., France; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 58; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Clementine UVVIS and NIR images have been used to interpret mineralogy of the lunar surface. We have applied two algorithms to the mosaic of the Aristarchus plateau produced by which efficiently map the regional mineralogy. This technique may be applied to the entirety of Clementine data now available.
Author
Lunar Surface; Lunar Maps; Spectrum Analysis; Mineralogy

20020074712 Glasgow Univ., Dept. of Physics and Astronomy, UK
Call for Cooperation Between Lunar Scientists and Astronomers: Proposing Lunar Science Missions to Enable Astronomy from the Moon
Takahashi, Y. D., Glasgow Univ., UK; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 59; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Astronomers have long looked up at the Moon as a dream site to study the universe from. Observatories on the Moon have been proposed since at least the mid-1960s when humans began to have access to outer space. The most seriously investigated concept has been an array of antennas on the lunar far side for very-low-frequency radio astronomy. Shielded from the terrestrial interference, such an observatory could give us new views of the universe through the completely new spectral window of 50 kHz - 30 MHz. However, in investigating astronomical observations from the Moon, we have many times needed more details about the physical characteristics of the lunar environment than are available at present. Many of these details are crucial in selecting the site, designing the instrument, and assessing the performance. Measurements at candidate sites are especially important in identifying the best site. Since the best sites are large craters on the lunar far side, geologists should hopefully share interest in such site-specific studies.
Author
Astronomical Observatories; Lunar Surface; Lunar Based Equipment; Space Missions; Lunar Far Side

20020074713 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA
Lunar Prospecting
Taylor, G. Jeffrey, Hawaii Univ., USA; Martel, Linda, Hawaii Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 60; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Space resources are essential for space settlement: Large space settlements on the Moon or Mars will require use of indigenous resources to build and maintain the infrastructure and generate products for export. Prospecting for these resources on the Moon is a crucial step in human migration to space and needs to begin before the establishment of industrial complexes. We are devising a multi-faceted approach to prospect for resources that involves planetary research, technology development, human workforce training, and education. Our work builds on previous studies.
Author
Lunar Resources; Lunar Mining; Lunar Geology

20020074714 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA
Bulk Composition of the Moon: Importance, Uncertainties, and What We Need to Know
Taylor, G. Jeffrey, Hawaii Univ., USA; Hawke, B. Ray, Hawaii Univ., USA; Spudis, Paul D., Lunar and Planetary Inst., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 61; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The bulk composition of the Moon is important to test models for how the Moon formed and to understand how the terrestrial planets accreted. Models of the accretion of the terrestrial planets from a disk of lunar to Mars-sized embryos indicate widespread mixing of the embryos and their fragments, so that each terrestrial planet formed from material originally located throughout the inner solar system (0.5 to 2.5 AU). Such a process would erase any initial radial chemical variations in the compositions of the planetesimals and in the final assembled planets. However, Robinson and Taylor suggest that a distinct compositional gradient remains as shown by the FeO contents of the terrestrial planets: Mercury (3 wt%), Venus and Earth (8 wt%), and Mars (18 wt%). Drake and Righter discuss the unique composition of the Earth and also conclude that planets accreted mostly from narrow feeding zones. Knowing the composition of the Moon will help us understand the full extent of the Earth's accretion zone. We examine what we know about the composition of the Moon, with emphasis on elements that can be determined by remote sensing techniques (FeO, Al2O3, and Th).
Author
Lunar Composition; Lunar Evolution; Solar System Evolution; Lunar Crust; Lunar Mantle

20020074716 Los Alamos National Lab., NM USA

Contoured Data From Lunar Prospector Indicate a Major Role for Minor Samples

Vaniman, D. T., Los Alamos National Lab., USA; Prettyman, T. H., Los Alamos National Lab., USA; Lawrence, D. J., Los Alamos National Lab., USA; Elphic, R. C., Los Alamos National Lab., USA; Feldman, W. C., Los Alamos National Lab., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 63; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Lunar Prospector (LP) gamma-ray data are now available for most major elements to cover the Moon at a resolution of 5 deg. At this resolution, full lunar coverage is 1790 data points. Although precision and accuracy of LP array data are still being evaluated, data available show the range and diversity of lunar surface composition at this resolution. .

Author

Lunar Surface; Lunar Maps; Lunar Rocks; Lunar Soil

20020074719 Northwestern Univ., Evanston, IL USA

Regolith Thickness, Distribution, and Processes Examined at Sub-Meter Resolution

Wilcox, B. B., Northwestern Univ., USA; Robinson, M. S., Northwestern Univ., USA; Thomas, P. C., Cornell Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 66; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have utilized very high resolution (60-200 cm/p) Lunar Orbiter frames to investigate regolith thickness, distribution, and processes in both mare and highland areas. Previous studies have proposed that the depth to an interface between the regolith and a coherent substrate controls crater interior morphology (Q&O craters) and block distributions in and around host craters. To test this hypothesis we have mapped the distribution of these key morphologic indicators over mare and highland regions. Our data show that the block populations and Q&O crater populations are generally consistent with this idea. However, we have noted some important deviations, namely that the indicators are irregularly distributed and thus seem to imply a highly variable regolith thickness in a local area. Another important result of our data is the documentation that at small sizes the mare contain greater numbers of craters.

Author

Lunar Surface; Lunar Craters; Regolith; Thickness; Lunar Maria

20020074720 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Current and Future Lunar Science from Laser Ranging

Williams, J. G., Jet Propulsion Lab., California Inst. of Tech., USA; Boggs, D. H., Jet Propulsion Lab., California Inst. of Tech., USA; Ratcliff, J. T., Jet Propulsion Lab., California Inst. of Tech., USA; Dickey, O., Jet Propulsion Lab., California Inst. of Tech., USA; Murphy, T. W., Washington Univ., USA; The Moon Beyond 2002: Next Steps in Lunar Science and Exploration; 2002, pp. 67; In English; Also announced as 20020074653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The interior properties of the Moon influence lunar tides and rotation. Three-axis rotation and tides are sensed by tracking lunar landers. The Lunar Laser Ranging (LLR) experiment has acquired three decades of accurate ranges from observatories on the Earth to four corner-cube retroreflector arrays on the Moon.

Author

Lunar Tides; Lunar Rotation; Laser Ranging; Lunar Core

20020074724 NASA Goddard Space Flight Center, Greenbelt, MD USA

On the Distribution and Implications of Mantled and Exhumed Terrains on Mars

Arvidson, R. E., Washington Univ., USA; Christensen, P. R., Arizona State Univ., USA; Garvin, J., NASA Goddard Space Flight Center, USA; Mellon, M., Colorado Univ., USA; Solar System Remote Sensing; 2002, pp. 3-4; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The intent of this paper is to show the relationships for Mars among albedo, thermal inertia, roughness inferred from MOLA pulse width spread data, and geology inferred from photogeological analyses. Mapping of surface units using these parameters and approaches, in combination with analysis of hyperspectral image data from ISM, TES, OMEGA, and CRISM observations, will maximize our understanding of the distribution and nature of surface units on the red planet. Results will directly impact the selection of landing sites that exhibit geological records needed to understand planetary habitability.

Author

Mars Surface; Photogeology; Spectrum Analysis; Planetary Mapping; Albedo; Thermal Emission

20020074725 NovaSol, Honolulu, HI USA

Testing the Hapke Model for the Optical Effects of Space Weathering

Blewett, D. T., NovaSol, USA; Lucey, P. G., Hawaii Univ., USA; Solar System Remote Sensing; 2002, pp. 5-6; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

In the Apollo era, Hapke and colleagues used simulation experiments and theoretical considerations to argue for the importance of vaporphase coatings in causing lunar soils to darken and redden with age. During the 1990s, direct detection of vapor-deposited iron on actual lunar soil grains came from the work of Keller and associates. These workers discovered that most soil grains have coatings, some of which differ from the interior composition. The morphology of the coatings is such that they must have condensed from a vapor. The coatings and grain rims typically contain abundant submicroscopic iron particles (SMFe). While SMFe is largely responsible for the reddening of lunar soil, Hapke's work suggests that it alone does not account for the changes accompanying soil maturity. For example, Hapke found that the inclusion of dark glass was required in addition to submicroscopic iron to account for weathering trends. Using a different formalism, Shkuratov et al. emphasized the importance of known particle size evolution in maturation modeling to match observed space weathering trends. Therefore Hapke's ground-breaking work must be followed up to show how the model glass content and composition and grain size evolution required to fit observed data compare to measured soil properties.

Author

Optical Properties; Space Weathering; Lunar Soil; Astronomical Models; Computerized Simulation; Grain Size

20020074727 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

The Diverse Surface Compositions of the Galilean Satellites

Carlson, R. W., Jet Propulsion Lab., California Inst. of Tech., USA; Solar System Remote Sensing; 2002, pp. 9; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The galilean satellites represent a diverse collection, ranging from the volcanic moon Io, with a surface that is changing yearly, to Callisto, with a dark, ancient surface overlying ice. The composition of these surfaces are also quite different due to a variety of processes and influences, including tidal heating, radiolysis, gardening, a magnetic field (Ganymede), and meteoritic infall. Io's surface contains large quantities of sulfur dioxide (SO2) and colorful sulfur allotropes, both originating in plumes and flows from the tidally driven volcanoes. A broad, 1-micron band is found at high latitudes and may be due to absorption by long-chain sulfur polymers produced by SO2 radiolysis, although iron and iron sulfide compounds are candidates. An unidentified 3.15 micron absorber is equatorially distributed while a 4.62 micron band, perhaps due to a sulfate compound, exhibits a non-uniform distribution. Hot spots are generally dark, and some exhibit negative reflectance slopes (i.e., blue). The composition of these lavas has not been established spectroscopically, but the high temperatures of some volcanoes suggest ultramafic silicates or perhaps more refractory material such as oxides.

Author

Galilean Satellites; Planetary Surfaces; Planetary Composition; Spectral Reflectance

20020074730 NASA Goddard Space Flight Center, Greenbelt, MD USA

ANTS: Applying A New Paradigm for Lunar and Planetary Exploration

Clark, P. E., L3 Com Analytics Corp., USA; Curtis, S. A., NASA Goddard Space Flight Center, USA; Rilee, M. L., L3 Com Analytics Corp., USA; Solar System Remote Sensing; 2002, pp. 15-16; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

ANTS (Autonomous Nano- Technology Swarm), a mission architecture consisting of a large (1000 member) swarm of picoclass (1 kg) totally autonomous spacecraft with both adaptable and evolvable heuristic systems, is being developed as a NASA advanced mission concept, and is here examined as a paradigm for lunar surface exploration. As the capacity and complexity of hardware and software, demands for bandwidth, and the sophistication of goals for lunar and planetary exploration have increased, greater cost constraints have led to fewer resources and thus, the need to operate spacecraft with less frequent human contact. At present, autonomous operation of spacecraft systems allows great capability of spacecraft to 'safe' themselves and survive when conditions threaten spacecraft safety. to further develop spacecraft capability, NASA is at the forefront of development of new mission architectures which involve the use of Intelligent Software Agents (ISAs), performing experiments in space and on the ground to advance deliberative and collaborative autonomous control techniques. Selected missions in current planning stages require small groups of spacecraft weighing tens, instead of hundreds, of kilograms to cooperate at a tactical level to select and schedule measurements to be made by appropriate instruments onboard. Such missions will be characterizing rapidly unfolding

real-time events on a routine basis. The next level of development, which we are considering here, is in the use of autonomous systems at the strategic level, to explore the remote terranes, potentially involving large surveys or detailed reconnaissance.
Author
Mission Planning; Unmanned Spacecraft; Lunar Surface; Lunar Exploration; Remote Sensing

20020074731 Observatoire de Midi-Pyrenees, Toulouse, France
Planetary Regolith Surface Analogs and Mesoscale Topography: Optimized Determination of Hapke Parameters Using Multi-Angular Spectro-Imaging Laboratory Data
Cord, A., Observatoire de Midi-Pyrenees, France; Pinet, P., Observatoire de Midi-Pyrenees, France; Daydoul, Y., Observatoire de Midi-Pyrenees, France; Stankevich, D., Kharkov Astronomical Observatory, Ukraine; Shkuratov, Yu., Kharkov Astronomical Observatory, Ukraine; Solar System Remote Sensing; 2002, pp. 17-18; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Reflectance spectroscopy is now a tool widely used for remote sensing applications, both in planetary and terrestrial observation. Among the large number of possibilities offered by this technique, the investigation of the surface mineralogy of a target is often explored. However, with the considerable increase of the spatial resolution of optical experiments on and near the planetary surfaces, it becomes more and more important to understand the physics that control the light interaction process with soils, in order to better interpret the physical (nature, texture, surface roughness, maturity, degree of cristallinity) and mineralogical properties of the surface at subpixel scale. Over the years, a number of semi-empirical models have been developed for analyzing the bidirectional reflectance of particulate surfaces on the basis of the scattering and absorption properties of minerals and rocks. In particular, Hapke developed an approximate analytical solution, which provides a description of the photometric behavior in terms of physically meaningful parameters. This work uses a method, founded on a genetic algorithm, for a determination of the global set of parameters involved in Hapke's model for planetary surface analogs when dealing with a set of angular conditions representative of the usual range of observation in planetary exploration for spaceborne optical instruments.
Author
Planetary Surfaces; Spectral Reflectance; Computerized Simulation; Genetic Algorithms; Soils; Angular Resolution

20020074732 Lowell Observatory, Flagstaff, AZ USA
Toward an Improved Single-Particle Model for Large Irregular Grains
Grundy, W. M., Lowell Observatory, USA; Schmitt, B., Grenoble-1 Univ., France; Doute, S., Grenoble-1 Univ., France; Solar System Remote Sensing; 2002, pp. 19-20; In English; Also announced as 20020074722; Sponsored in part by the Programme National de Planetologie de I'INSU
Contract(s)/Grant(s): NAG5-10159; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

To interpret remote spectral observations, scattering and absorption in a particulate surface are simulated via radiative transfer models. The standard model for this purpose among the planetary science community is the Hapke model. This model (like many others) uses two parameters to characterize the optical behavior of individual grains in a particulate surface, the single-scattering albedo omega and phase function p(g). These terms describe, respectively, the quantity and the angular distribution of light scattered by an individual grain. Unfortunately, these parameters are strictly optical. They can be rather difficult to interpret in terms of more interesting particle properties such as grain sizes, shapes, and compositions, that a remote sensing experiment might seek to discover. An equivalent slab approximation is typically used to relate omega to the grain size and optical constants of the material. This approach can mimic the wavelength-dependent absorption behavior of irregular grains, as long as the imaginary index kappa is much less than 1, the shape is equant, and the grain size D is much larger than the wavelength lambda. Unfortunately, the equivalent slab approach provides no information about p(g), which also has a strong dependence on optical constants and particle form.
Author
Grain Size; Planetary Surfaces; Models; Optical Properties

20020074734 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Mars Radar Observations with the Goldstone Solar System Radar
Haldemann, A. F. C., Jet Propulsion Lab., California Inst. of Tech., USA; Jurgens, R. F., Jet Propulsion Lab., California Inst. of Tech., USA; Larsen, K. W., Washington Univ., USA; Arvidson, R. E., Washington Univ., USA; Slade, M. A., Jet Propulsion Lab., California Inst. of Tech., USA; Solar System Remote Sensing; 2002, pp. 23-24; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Goldstone Solar System Radar (GSSR) has successfully collected radar echo data from Mars over the past 30 years. As such, the GSSR has played a role as a specific mission element within Mars exploration. The older data provided local elevation information for Mars, along with radar scattering information with global resolution. Since the upgrade to the 70-m Deep Space Network (DSN) antenna at Goldstone completed in 1986, Mars data has been collected during all but the 1997 Mars opposition. Radar data, and non-imaging delay-Doppler data in particular, requires significant data processing to extract elevation, reflectivity and roughness of the reflecting surface. The spatial resolution of these experiments is typically some 20 km in longitude by some 150 km in latitude. The interpretation of these parameters while limited by the complexities of electromagnetic scattering, do provide information directly relevant to geophysical and geomorphic analyses of Mars. The usefulness of radar data for Mars exploration has been demonstrated in the past. Radar data were critical in assessing the Viking Lander 1 site as well as, more recently, the Pathfinder landing site. In general, radar data have not been available to the Mars exploration community at large. A project funded initially by the Mars Exploration Directorate Science Office at the Jet Propulsion Laboratory (JPL), and later funded by NASA's Mars Data Analysis Program has reprocessed to a common format a decade's worth of raw GSSR Mars delay-Doppler data in aid of landing site characterization for the Mars Program. These data will soon be submitted to the Planetary Data System (PDS). The radar data used were obtained between 1988 and 1995 by the GSSR, and comprise some 63 delay-Doppler radar tracks. of these, 15 have yet to be recovered from old 9-track tapes, and some of the data may be permanently lost.

Author

Mars (Planet); Radar Echoes; Mars Exploration; Data Processing; Geomorphology; Mars Surface

20020074735 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Thermal Modeling on Planetary Regoliths

Hale, A. S., Jet Propulsion Lab., California Inst. of Tech., USA; Hapke, B.W., Pittsburgh Univ., USA; Solar System Remote Sensing; 2002, pp. 25; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The thermal region of the spectrum is one of special interest in planetary science as it is the only region where planetary emission is significant. Studying how planetary surfaces emit in the thermal infrared can tell us about their physical makeup and chemical composition, as well as their temperature profile with depth. This abstract will discuss a model of thermal energy transfer in planetary regoliths on airless bodies which includes both conductive and radiative processes while including the time dependence of the solar input function.

Author

Planetary Surfaces; Radiative Heat Transfer; Regolith; Models; Infrared Radiation

20020074737 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

The Lunar Phase Curve in the Near Ultraviolet

Hendrix, A. R., Jet Propulsion Lab., California Inst. of Tech., USA; Solar System Remote Sensing; 2002, pp. 29; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

We present results from an ongoing program to perform UV measurements (215.0 and 237.0 nm) of the Moon at varying solar phase angles to understand the lunar phase curve at ultraviolet wavelengths. We use new observations from the Ultraviolet Spectrometer (UVS) aboard the Student Nitric Oxide Explorer (SNOE) combined with existing observations from the Galileo UVS. The lunar UV phase curve can be used to further understand the scattering properties of the lunar surface. The Moon's scattering properties at visible wavelengths are well understood; studying scattering properties at shorter wavelengths may provide insight into the roles of volume scattering vs. surface scattering and how weathering processes may affect scattering properties. The UV lunar phase curve can also be helpful for UV observers, as the Moon is often used as a UV calibration source, but the UV brightness variation with phase angle has not been well understood.

Author

Ultraviolet Radiation; Lunar Surface; Scattering Functions; Space Weathering; Spectrophotometry

20020074738 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Ultraviolet Surface Properties of the Icy Galilean Satellites from Phase Curve Analysis

Hendrix, A. R., Jet Propulsion Lab., California Inst. of Tech., USA; Dominique, D. L., Johns Hopkins Univ., USA; Solar System Remote Sensing; 2002, pp. 31-32; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

In this study, we use ultraviolet observations from the International Ultraviolet Explorer (IUE) and the Galileo Ultraviolet Spectrometer (UVS) to compose the ultraviolet solar phase curves of the icy Galilean satellites. Broadband rotation phase curves

from 0.26 to 0.32 microns are constructed in order to examine the rotational behavior of the icy Galilean satellites in the ultraviolet. After normalizing the rotational variations, modeling of the solar phase variations are compared to comparable studies in the visible.
Author
Galilean Satellites; Ultraviolet Astronomy; Rotation; Albedo; Astronomical Spectroscopy; Satellite Surfaces

20020074739 Academy of Sciences (USSR), Space Research Inst., Moscow, USSR
Earth-Based Radar Speckle Displacement Interferometry to Study the Spin-Vector of Venus
Holin, I. V., Academy of Sciences (USSR), USSR; Solar System Remote Sensing; 2002, pp. 33-34; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The spin-vector of Venus was investigated by various Earth- and spacecraft-based techniques but until now no experimental data have been obtained on variations of both in magnitude and direction because of insufficient accuracy and too long measuring interval (much longer than the period of variations). In this work a new on principle ground-based radar interferometric technique named Radar Speckle Displacement Interferometry (RSDI) is proposed to measure precisely instantaneous vector components of and their variations with time. The technique is based on a so called far coherence (speckle displacement) effect for speckled radar fields scattered from randomly rough surfaces of moving objects and aims at precise measurement of their instantaneous rotational- progressive motion parameters.
Author
Radar Astronomy; Speckle Interferometry; Venus (Planet); Planetary Rotation

20020074740 Academy of Sciences (USSR), Space Research Inst., Moscow, USSR
Evidence for Global Radar Speckle Pattern Displacement to Measure Mercury's Obliquity and Librations
Holin, I. V., Academy of Sciences (USSR), USSR; Solar System Remote Sensing; 2002, pp. 35-36; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Let us illuminate Mercury by a monochromatic radiowave at wavelength lambda = 3.5 cm. Due to coherent illumination and rough surface of Mercury the backscattering pattern is speckled like those well known and easy observable in laser optics experiments. Further processing of data from the Goldstone - Green Bank experiment may lead to the first determination of Mercury's obliquity and librations.
Derived from text
Mercury (Planet); Mercury Surface; Librational Motion; Radar Astronomy; Planetary Rotation; Speckle Patterns

20020074741 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA
Using the Hapke Rough Reflectance Factor for Calibration of Atmospheric Emissions at Mercury and the Moon
Hunten, Donald M., Arizona Univ., USA; Sprague, Ann L., Arizona Univ., USA; Solar System Remote Sensing; 2002, pp. 37; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Emission lines of atmospheric constituents of the Moon and Mercury (especially sodium and potassium) must be absolutely calibrated before the abundances can be obtained. It is convenient to use the intensity of the surface at an adjacent wavelength as the standard, and to use Hapke theory to obtain this intensity. This procedure and some of its pitfalls are discussed here.
Author
Emission Spectra; Mercury Atmosphere; Lunar Atmosphere; Atmospheric Composition; Calibrating

20020074742 Geological Survey, Mars Data Analysis Program, Flagstaff, AZ USA
Dust Coatings at the Mars Pathfinder Landing Site
Johnso, J. R., Geological Survey, USA; Grundy, W. M., Lowell Observatory, USA; Lemmon, M. T., Texas A&M Univ., USA; Solar System Remote Sensing; 2002, pp. 39-40; In English; Also announced as 20020074722
Contract(s)/Grant(s): MDAP-W-19-898; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Multispectral imaging of the Mars Pathfinder (MPF) radiometric calibration targets (RCTs) by the Imager for Mars Pathfinder (IMP) camera provided sufficient data to model the photometric changes associated with variable deposition of atmospheric dust on the RCTs. Sky models were used to correct for variations in diffuse/direct illumination conditions during the mission, and two-layer Hapke radiative transfer models were developed to constrain variations in spectral properties associated with dust deposition on the RCTs. The results are consistent with dust deposition during the MPF mission amounting to dust optical depth

(tau) values less than 0.5 (i.e., less than 10 microns effective thickness of 10-20 micron particles for porosity 0.80), although variability in the dust thickness with time may result from erosive/depositional phases of aeolian activity.
Author
Mars Pathfinder; Landing Sites; Dust; Photometry; Deposition; Mars Atmosphere; Mars Surface

20020074743 NASA Johnson Space Center, Houston, TX USA
Microstructural Studies of Space Weathering Effects in Lunar Materials
Keller, L. P., NASA Johnson Space Center, USA; Solar System Remote Sensing; 2002, pp. 41-42; In English; Also announced as 20020074722
Contract(s)/Grant(s): RTOP 344-31-40-07; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Space weathering is a term used to include all of the processes which act on material exposed at the surface of a planetary or small body. In the case of the moon, it includes a variety of processes which have formed the lunar regolith, caused the maturation of lunar soils, and formed patina on rock surfaces. The processes include micrometeorite impact and reworking, implantation of solar wind and flare particles, radiation damage and chemical effects from solar particles and cosmic rays, interactions with the lunar atmosphere, and sputtering erosion and deposition. Space weathering effects collectively result in a reddened continuum slope, lowered albedo, and attenuated absorption features in reflectance spectra of lunar soils as compared to finely comminuted rocks from the same Apollo sites. However, the regolith processes that cause these effects are not well known, nor is the petrographic setting of the products of these processes fully understood. An interesting confluence of events occurred in the early 1990s. First, came the discovery of vapor deposited coatings on lunar regolith grains by Keller and McKay, who showed that amorphous coatings from 50-100 nm thick containing fine-grained Fe metal (1-10 nm in diameter) were common in the fine size fraction of several mature lunar soils. The other discovery was the recognition that the optical properties of lunar soils were dominated by fine grain sized material (less than 45 micrometer fraction) by Pieters and coworkers. These discoveries led to coordinated studies that looked at the mineralogy, chemistry, and optical properties of lunar soils as function of composition, maturity, and grain size fraction. One of the major revelations from these studies was the recognition that much of the nanophase Fe metal is surface-correlated especially in the finest size fractions, and that it was this nanophase Fe that dominated the optical properties of the soil.
Derived from text
Space Weathering; Regolith; Lunar Soil; Lunar Surface

20020074744 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
Four Station Interferometric Radar Observations of Mars
Larsen, K. W., Washington Univ., USA; Jurgens, R. F., Jet Propulsion Lab., California Inst. of Tech., USA; Arvidson, R. E., Washington Univ., USA; Slade, M. A., Jet Propulsion Lab., California Inst. of Tech., USA; Haldemann, A. F., Jet Propulsion Lab., California Inst. of Tech., USA; Solar System Remote Sensing; 2002, pp. 43-44; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Planetary targets have been observed with radar since the late 1950s when it was first used for ranging experiments with the Moon. As telescope size and power increased, it became possible to observe more distant targets (Venus, Mars, and the outer satellites). Inherent to radar observations is the uncertainty as to the source of the reflection, there being two points where range and Doppler rings intersect on a sphere. The use of interferometric methods, first used on the moon with two stations and later on Venus and Mars, solved this problem. We extend the method through the addition of a fourth receiving telescope (thus doubling the number of projected baselines) and integration of the newly available Mars Orbiter Laser Altimeter (MOLA) topographic datasets.
Author
Astronomical Interferometry; Radar Astronomy; Mars (Planet)

20020074745 Hawaii Univ., Hawaii Inst. of Geophysics and Planetology, Honolulu, HI USA
A Complete First Order Hapke Model of the Near-Infrared Spectral Reflectance of the Moon
Lucey, P. G., Hawaii Univ., USA; Solar System Remote Sensing; 2002, pp. 45; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The spectral reflectance properties of the Moon are governed by the minerals and glasses composing the lunar regolith, their physical state, and the optical effects of soil maturity. Work by Hapke and others has provided all the tools necessary to produce a model of near-IR spectra of the Moon within simplifying assumptions. We have produced such a model and are beginning to apply it to lunar science problems. Two classes of problems are amenable to immediate use: determining compositions of lunar surface regions using groundbased and Clementine data, and understanding the detection limits for minerals and rock types using

existing and planned data sets. Optical constants of all components are required for this model. An inversion of Hapke equations was presented in order to compute optical constants from reflectance spectra.
Derived from text
Spectral Reflectance; Lunar Soil; Regolith; Lunar Surface

20020074747 NASA Ames Research Center, Moffett Field, CA USA
CRISM: Compact Reconnaissance Imaging Spectrometer for Mars on the Mars Reconnaissance Orbiter
Murchie, S., Johns Hopkins Univ., USA; Arvidson, R., Washington Univ., USA; Barnouin-Jha, O., Centre National d'Etudes Spatiales, France; Beisser, K., Johns Hopkins Univ., USA; Bibring, J.-P., Centre National d'Etudes Spatiales, France; Bishop, J., NASA Ames Research Center, USA; Boldt, J., Johns Hopkins Univ., USA; Choo, T., Centre National d'Etudes Spatiales, France; Clancy, R, Space Science Inst., USA; Darlington, E. H., Centre National d'Etudes Spatiales, France; Solar System Remote Sensing; 2002, pp. 49-50; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) on the Mars Reconnaissance Orbiter (MRO) will conduct a comprehensive series of investigations of the Martian surface and atmosphere. The investigations will be accomplished using an instrument design that provides high spatial and spectral resolutions, extended wavelength range, and ability to gimbal through a range of orientations. Baseline investigations include a near-global survey to find high science priority sites, full-resolution measurement of thousands of such sites, and tracking of seasonal variations in atmospheric and surface properties.
Author
Imaging Spectrometers; Mars Atmosphere; Mars Surface; Mars Environment

20020074749 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA
The Opposition Effect: A Very Unusual Case
Nelson, R. M., Jet Propulsion Lab., California Inst. of Tech., USA; Solar System Remote Sensing; 2002, pp. 53; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The reflection of electromagnetic radiation from a planetary regolith involves a combination of geometric and physical optics processes which contribute to the signal returned to the remote observer. The geometric optics effects are the product of singly and multiply scattered radiation from the surfaces of the regolith particles, combined with radiation which has undergone various combinations of transmission through one or more regolith grains followed by one or more scatterings from other particles. The physical optics effects include diffraction of radiation around the edges of large irregular particles and cooperative coherent scattering between particles which are small when compared to the wavelength of the incident radiation. These effects produce measurable changes in the intensity and polarization of reflected light as a function of illumination and viewing geometry. In particular, as phase angle becomes small, the reflectance of a particulate material will increase non-linearly and exhibit the 'opposition effect'. In the planetary science context, the phase curve, and in particular the size of the opposition surge and the width of the phase curve near zero degrees, have been attributed to two processes commonly called 'shadow hiding' (SHOE) and 'coherent backscattering' (CBOE).
Derived from text
Regolith; Planetary Surfaces; Reflectance; Backscattering; Coherent Scattering; Incident Radiation; Diffraction Radiation

20020074750 Brown Univ., Dept. of Geological Sciences, Providence, RI USA
Space Weathering Processes on Mercury
Noble, S. K., Brown Univ., USA; Pieters, C. M., Brown Univ., USA; Solar System Remote Sensing; 2002, pp. 55-56; In English; Also announced as 20020074722
Contract(s)/Grant(s): NAG5-4303; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Like the Moon, Mercury has no atmosphere to protect it from the harsh space environment and therefore it is expected that it will incur the effects of space weathering. These weathering processes are capable of both creating regolith and altering its optical properties. However, there are many important differences between the environments of Mercury and the Moon. These environmental differences will almost certainly affect the weathering processes as well as the products of those processes. It should be possible to observe the effects of these differences in Vis/NIR spectra of the type expected to be returned by MESSENGER. More importantly, understanding these weathering processes and their consequences is essential for evaluating the spectral data returned from MESSENGER and other missions in order to determine the mineralogy and the iron content of the Mercurian surface. Theoretical and experimental work has been undertaken in order to better understand these consequences.
Author
Space Weathering; Mercury Surface; Mineralogy; Emission Spectra

20020074751 Kharkov Astronomical Observatory, Kharkov, Ukraine

New Estimates of Lunar Opposition Spike Characteristics with Clementine Data

Omelchenko, V., Kharkov Astronomical Observatory, Ukraine; Kaydash, V., Kharkov Astronomical Observatory, Ukraine; Shkuratov, Yu., Kharkov Astronomical Observatory, Ukraine; Solar System Remote Sensing; 2002, pp. 57-58; In English; Also announced as 20020074722

Contract(s)/Grant(s): INTAS-2002-0792; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Several techniques have been used to estimate the opposition spike parameters of the lunar surface by Clementine data. The simplest way is averaging many images that contain the spacecraft shadow point (zero-phase-angle point) neglecting albedo variations, which anyhow remain after the averaging. More accurate way is to use a phase-ratio image, one component (one initial image) of which contains the zero-phase-angle point and the other one is obtained at larger phase angles. This technique is more precise as the phase-ratio images almost do not contain albedo variations. A drawback of both these approaches is strong dependence of final results on camera characteristics drift that was considerable during the mission. The third technique suggests to use images acquired almost simultaneously and containing the zero-phase-angle point. It allows to avoid problems with the drift of camera parameters. With that technique logarithmic derivatives of the phase function for each point of imaged surface can be calculated. For this purpose D/C color-ratio (from UVVIS (ultraviolet-visable) camera images) is used. A shortcoming of the technique is availability of slight variations of the D/C color-index (D = 0.95 micron and C = 0.90 micron) over the ratio image. We estimate here an opposition spike parameter for several small mare and adjacent highland regions of the lunar surface suggesting a new technique (that develops the third one), which is also free of the UVVIS camera characteristics drift. We have studied a near-equatorial region placed in the latitude range 8N - 8S at the 0.5E longitude (the lunar near-side).
Author

Lunar Surface; Imaging Techniques

20020074753 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Size-Dependent Scattering Properties of Planetary Regolith Analogs

Piatek, J. L., Pittsburgh Univ., USA; Hapke, B., Pittsburgh Univ., USA; Nelson, R. M., Jet Propulsion Lab., California Inst. of Tech., USA; Hale, A. S., Jet Propulsion Lab., California Inst. of Tech., USA; Smythe, W. D., Jet Propulsion Lab., California Inst. of Tech., USA; Solar System Remote Sensing; 2002, pp. 61-62; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Particles in a planetary regolith can be treated as independent scatterers when their size is large compared with the wavelength of light. The nature of this scattering, however, is poorly understood as the particle size approaches and becomes smaller than the wavelength. In order to understand this interaction better, the reflectances of well-sorted particulate samples of known composition were measured. This reflectance data was then analyzed to determine how scattering properties change with particle size.
Author

Planetary Surfaces; Regolith; Particulates; Scattering

20020074754 Brown Univ., Dept. of Geological Sciences, Providence, RI USA

Lessons Learned from Lunar Exploration: The Moon Continues to Surprise Us

Pieters, C. M., Brown Univ., USA; Solar System Remote Sensing; 2002, pp. 63-64; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

This article addresses unexpected discoveries in recent lunar exploration, including the South Pole-Aitken Basin (SPA), a thorium 'hot spot' in the Imbrium Basin, hydrogen (possibly water ice) at the lunar poles, and the contrast between the appearance of lunar soil samples and remote imagery of the lunar surface. It also summarizes the history of manned and unmanned lunar exploration, from the Apollo program to Clementine and Lunar Prospector in the 1990s. A section at the end of the article addresses the importance of lunar samples.
CASI

Lunar Surface; Lunar Soil; Lunar Exploration; Soil Sampling; Ice; Thorium

20020074756 NASA Ames Research Center, Moffett Field, CA USA

Compositional Remote Sensing of Icy Planets and Satellites Beyond Jupiter

Roush, Ted L., NASA Ames Research Center, USA; Solar System Remote Sensing; 2002, pp. 67-68; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The peak of the solar energy distribution occurs at visual wavelengths and falls off rapidly in the infrared. This fact, improvements in infrared detector technology, and the low surface temperatures for most icy objects in the outer solar system have

resulted in the bulk of telescopic and spacecraft observations being performed at visual and near-infrared wavelengths. Such observations, begun in the early 1970's and continuing to present, have provided compositional information regarding the surfaces of the satellites of Saturn and Uranus, Neptune's moon Triton, Pluto, Pluto's moon Charon, Centaur objects, and Kuiper belt objects. Because the incident sunlight penetrates the surface and interacts with the materials present there, the measured reflected sunlight contains information regarding the surface materials, and the ratio of the reflected to incident sunlight provides a mechanism of identifying the materials that are present.
Author
Icy Satellites; Pluto (Planet); Kuiper Belt; Infrared Astronomy; Planetary Surfaces; Planetary Composition

20020074757 Tokyo Univ., Dept. of Earth and Planetary Sciences, Hongo, Japan
Simulation of Space Weathering by Nanosecond Pulse Laser Irradiation: Spectral Change and TEM-ESR Confirmation of Nanophase Iron Particles
Sasaki, S., Tokyo Univ., Japan; Kurahashi, E., Tokyo Univ., Japan; Nakamura, K., Kobe Univ., Japan; Hiroi, T., Brown Univ., USA; Yamanaka, C., Osaka Univ., Japan; Solar System Remote Sensing; 2002, pp. 69-70; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

In 1975, while examining why lunar regolith becomes darker and redder with time, Bruce Hapke with colleagues advocated that the lunar soil grains should have been coated with vapor-deposited rim containing nanometer-sized iron particles. High-velocity dust impacts and/or solar wind irradiations might produce ferrous silicate vapor. This process is called 'space weathering'. However, this hypothesis had been ignored until nanophase iron particles were confirmed in lunar regolith grains by TEM. S-type asteroids, majority in asteroids, are believed to be parent bodies of ordinary chondrites, which are a large majority in meteorites. However, S-type steroids exhibit more overall depletion and reddening of spectra, and more weakening of absorption bands relative to ordinary chondrites. This spectral mismatch is also considered being caused by space weathering process. Recent observation by Galileo showed that fresh crater interior and ejecta on S-type Ida have the spectra closer to that of ordinary chondrites. Some small asteroids have intermediate spectra between S-type and Q-type (ordinary-chondrite like) spectra. NEAR's X-ray spectrometer showed that S-type 433 Eros has elemental composition close to ordinary chondrites.
Author
Space Weathering; Irradiation; Chondrites; Asteroids; Iron; Particulates

20020074759 Washington Univ., Dept. of Earth and Planetary Sciences, Saint Louis, MO USA
Remote Sensing Analysis of the Terra Meridiani Region, Mars
Seelos, F. P., IV, Washington Univ., USA; Arvidson, R. E., Washington Univ., USA; Solar System Remote Sensing; 2002, pp. 73-74; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

We report on a multifaceted investigation of remote sensing data for the Terra Meridiani region. Our study area extends +-10 degrees about the prime meridian and from -5 to +10 degrees in latitude, encompassing the largest of the hematite bearing regions identified on the surface of Mars. A detailed investigation of this area was motivated by the likely selection of the hematite-bearing unit as the destination for one of the twin MER (Mars Exploration Rovers) rovers. This study makes use of a variety of remote sensing data sets with the goal of characterizing the region to the fullest possible extent. The initial results from this body of work have contributed to the MER landing site selection process, and will aid in mission planning and operations if one of the rovers is sent to this region.
Author
Mars Surface; Landing Sites; Hematite; Remote Sensing; Site Selection

20020074760 Bloomsburg Univ., Dept. of Geography and Geosciences, Bloomsburg, PA USA
Initial Results from the Bloomsburg University Goniometer Laboratory
Shepard, M. K., Bloomsburg Univ., USA; Solar System Remote Sensing; 2002, pp. 75-76; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

The Bloomsburg University Goniometer Laboratory (B.U.G. Lab) consists of three systems for studying the photometric properties of samples. The primary system is an automated goniometer capable of measuring the entire bi-directional reflectance distribution function (BRDF) of samples. Secondary systems include a reflectance spectrometer and digital video camera with macro zoom lens for characterizing and documenting other physical properties of measured samples. Works completed or in progress include the characterization of the BRDF of calibration surfaces for the 2003 Mars Exploration Rovers (MER03), Martian analog soils including JSC-Mars-1, and tests of photometric models.
Author
Goniometers; Bidirectional Reflectance; Distribution Functions; Digital Cameras; Spectrometers

20020074761 Kharkov Astronomical Observatory, Kharkov, Ukraine
Interpreting Photometry of Planetary Regoliths: Progress and Problems as Seen from Kharkov
Shkuratov, Yu. G., Kharkov Astronomical Observatory, Ukraine; Solar System Remote Sensing; 2002, pp. 77-78; In English; Also announced as 20020074722
Contract(s)/Grant(s): INTAS-2000-0792; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Photometric observations of planetary regoliths demand a sophisticated interpreting basis that includes theoretical modeling, computer and laboratory simulations of light scattering. The high-level theoretical models were produced by B. Hapke, and they are widely used in planetology. At present time quick progress is observed in interpreting photometry. We overview here this progress and problems in understanding of physical mechanisms forming photometric properties of the planetary regoliths.
Author
Planetology; Regolith; Computerized Simulation; Photometry

20020074762 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA
Mercury's Surface Composition from Surface Spectroscopy
Sprague, Ann L., Arizona Univ., USA; Solar System Remote Sensing; 2002, pp. 79-80; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

During our 15 year quest to augment vis-near infrared spectroscopic (0.4 - 2.5 micron) discoveries with mid-infrared (2.5 - 13.5 micron) spectroscopic discoveries at Mercury, we have achieved much and learned even more. This talk (and paper) will describe some of those discoveries and lessons learned. Methods used to interpret mid-infrared spectra include 1) identification of key spectral features diagnostic of composition. This has been achieved in the laboratory using terrestrial and lunar rocks, minerals, powders, and glasses. 2) comparison of laboratory and telescopic mid-infrared spectra of lunar soils from similar locations on the Moon. 3) use of the same spectrograph to obtain spectra of rocks, minerals, and powders to compare to spectra of the Moon's and Mercury's surface and thus calibrate spectrograph performance and resulting spectral character. 4) comparison of spectra obtained from spacecraft above all of the Earth's atmosphere of objects in the solar system (Jupiter, Saturn, asteroids) to those obtained from midinfrared instruments from ground-based observatories.
Author
Infrared Spectroscopy; Astronomical Spectroscopy; Mercury Surface; Planetary Composition

20020074764 Science Applications International Corp., Advanced Technology Applications Div., Chantilly, VA USA
Combining the MGM and Hapke Theory: Two Models are Better than One
Sunshine, J. M., Science Applications International Corp., USA; Clark, B. E., Ithaca Coll., USA; Lucey, P. G., Hawaii Univ., USA; Solar System Remote Sensing; 2002, pp. 83; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Over the last several decades, remote spectroscopic studies have very successfully been used to explore the composition of various solid surfaces in the solar system. Building on these initial successes with mineral identification, recent efforts have focused on more detailed spectral inferences including assessing the composition and abundance of mafic minerals. Such efforts are complicated by the fact that most silicate-rich surfaces include lithologic combinations of several mafic minerals which have overlapping absorption bands. Two of the more quantitative approaches to spectral interpretation are non-linear mixture modeling based on Hapke's radiative transfer theory and absorption band modeling. Both have been used successfully, yet as described below, these two methods are very complimentary offer even greater promise if they can be successfully combined.
Author
Mineralogy; Astronomical Spectroscopy; Radiative Transfer; Absorption Spectra

20020074765 Tennessee Univ., Dept. of Geological Sciences, Knoxville, TN USA
Origin of Surface-Correlated and Agglutinitic Nanophase Fe0: A Bedtime Story for Bruce
Taylor, Lawrence A., Tennessee Univ., USA; Solar System Remote Sensing; 2002, pp. 85-86; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

It has become accepted lore that the myriad of grains of nanophase Fe(sup 0) (abbrev. npFe(sup 0)) in lunar agglutinates are the result of 'auto-reduction of impact-melted lunar soil in the presence of solar-wind hydrogen'. However, recent studies have demonstrated other sources of npFe(sup 0) in lunar soils, as present in thin patinas (approx. 0.1 micron) on the surfaces of most soil particles. The major portion of this npFe(sup 0) formed by deposition of vapor produced by abundant micrometeorite impacts, as documented by the presence of multiple and overlapping patinas. A smaller portion may have formed by radiation sputtering. The vapor deposition of this patina npFe(sup 0) is not actually at the surface, sensu stricto, but just below. It would appear that the presence of npFe(sup 0) in the vapor-deposited patinas (rims) on virtually all grains of a mature soil provides an additional

and abundant source for the greatly increased Is/Fe(sup 0) values observed. [At this point, I would like to see just how red with fury Bruce's face must be, as the above statements appear to steal his 'I told you so's.'.] You see, it was Bruce and his Pittsburgh colleagues that had astutely predicted all this way back in the Apollo days, but its significance went largely overlooked for decades. For an elegant and thorough review, albeit with a bit of bias, please read Hapke.
Author
Iron; Particulates; Agglutination; Lunar Soil; Sputtering; Vapor Deposition

20020074766 Science Applications International Corp., Chantilly, VA USA
Unmixing the Lunar Surface
Tompkins, S., Science Applications International Corp., USA; Solar System Remote Sensing; 2002, pp. 87-88; In English; Also announced as 20020074722; No Copyright; Avail: CASI; A01, Hardcopy; A02, Microfiche

Spectral mixture analysis has been shown to be a powerful, multifaceted tool for the analysis of spectral image data. In this approach small areas thought to represent distinct lithologies are chosen within the image. The spectral properties of these representative 'endmembers' are then combined in a least-squares mixing algorithm to provide the best fit for each pixel within the image. Each pixel is thus represented by the proportion of each endmember required to minimize the difference between the model and the actual spectra. Applications to both lunar and terrestrial remote sensing include mapping soils and exposed bedrock and modeling surface processes.
Author
Spectral Mixture Analysis; Lunar Surface; Lithology; Reflectance

20020076384 Proxemy Research, Inc., Laytonsville, MD USA
Proxemy Research Grant NAG5-10263 Closeout Report
Stofan, Ellen R., Proxemy Research, Inc., USA; Sep. 10, 2002; 9p; In English
Contract(s)/Grant(s): NAG5-10263; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Proxemy Research had a grant from NASA to perform science research of upwelling and volcanism on Venus. This was a 5 year Presidential Early Career Award to E. Stofan, entitled "Upwelling and volcanism: Constraints from regional studies and geologic mapping." Here we summarize the scientific progress and accomplishments of this grant. Scientific publications and abstracts of presentations are indicated in the final section. This was a very productive grant and the progress that was made is summarized. Attention is drawn to the publications, abstracts, and talks given in each year. Volcanism and tectonism are the dominant geological processes that have shaped the surface of Venus, as revealed by the Magellan data. However, the development of a global geologic history for Venus has caused considerable debate (e.g., Head and Basilevsky, 1996; Guest and Stofan, 1999). The lack of global time horizons on Venus, such as that provided by impact craters on most bodies and the fossil record on Earth, make developing global stratigraphies for Venus difficult, if not impossible, with current datasets. Before the geologic history of Venus can be determined and used as a constraint on potential lithospheric thickness variations through time, it is necessary to perform detailed stratigraphic studies on a local to regional scale. In addition, detailed studies of specific types of venusian features and terrains, such as coronae, volcanic rises, and large lava flow fields, may help to constrain the lithospheric thickness and its potential variations in time and space. This report describes progress made during the five year award under a Presidential Early Career Award for Scientists and Engineers which allows researchers freedom to explore new areas of research.
Derived from text
Stratigraphy; Venus (Planet); Venus Surface; Volcanology; Planetary Geology; Flow Distribution

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SOLAR PHYSICS

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

20020075033 Slovak Academy of Sciences, Bratislava Czechoslovakia
Extrapolation of Neutral Line Data from the Green Corona Since 1976 Back to 1947 ***Final Report, 9 Mar. 1999-26 Jul. 2001***
Rusin, Vojtech; May 21, 2001; 5p; In English
Contract(s)/Grant(s): F61775-99-WE014
Report No.(s): AD-A405022; SPC-99-4014; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report results from a contract tasking Slovak Academy of Sciences as follows: The contractor will investigate the evolution of large-scale solar magnetic fields. A direct comparison of coronal holes and magnetic neutral lines from 1976 to the

present will be extrapolated back to 1947 using magnetic neutral line measurements from the Astronomical Institute to determining the relationship of coronal holes with solar magnetic neutral lines over the 50 years from 1947 to the present.
DTIC
Solar Activity; Solar Corona; Solar Magnetic Field

20020076317 Helsinki Univ. of Technology, Kylmaelae Finland
Low-Frequency Modulations in Solar Millimeter Wave Bursts
Zaitsev, V. V.; Kislyakov, A. G.; Urpo, S.; Stepanov, A. V.; Shkelev, E. I.; 2001; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): PB2002-105638; HUT-MET-36; Copyright; Avail: National Technical Information Service (NTIS)

Analysis of low-frequency (LF) fluctuations of solar flare emission at 22 and 37 GHz is performed. Four microwave bursts observed in Metsahovi Radio Observatory with the time resolution of 100 and 50 ms are investigated. to find time-frequency diagram for LF-pulsations the Wagner-Ville method is applied. The Wagner-Ville (WV) transform presents a time-lag Fourier-conjugate of a local correlation function of an analytical signal formed using the sample of the signal to be investigated. As a result the dynamic spectra of LF-fluctuations were obtained in the first time, which were interpreted in terms of eigen oscillations of coronal magnetic loops. We compared as an example the time-frequency diagrams for selected events obtained by WV-method and Fast Fourier transform (FFT).
NTIS
Solar Flares; Modulation; Low Frequencies; Millimeter Waves; Fast Fourier Transformations

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.

20020075053 International Civil Aviation Organization, Montreal, Quebec Canada
Search and Rescue Operations of Aircraft in Africa: Some Compelling Issues
Abeyratne, Ruwantissa I. R., International Civil Aviation Organization, Canada; Journal of Air Transportation World Wide; 2002; ISSN 1093-8826; Volume 7, Nos. 2-3, pp. 55-72; In English; Copyright; Avail: Issuing Activity

The world aviation community has felt the compelling need for a well-coordinated global programme for search and rescue operations of aircraft ever since commercial aviation was regulated in 1944. Guidelines and plans of action for search and rescue have therefore been considered critical in the event of an aircraft accident. This fact is eminently brought to bear in the continental regions of Africa and South America in particular, where vast expanses of land are still uninhabited or sparsely populated and controlled flight into terrain (CFIT-where an aircraft may crash on land while still under the control of technical crew) is a common occurrence. There are numerous guidelines that have been adopted under the umbrella of the International Civil Aviation Organization which are already in place for the provision of search and rescue operations pertaining to aircraft. However, when an accident occurs in the territory of a State, there are sensitivities involving the State in which the aircraft concerned was registered and issues of sovereignty which have to be considered. Additionally. issues such as the voluntary nature of the search and rescue services offered. confidentiality, timeliness of such operations, fairness and uniformity all play a critical role. This article addresses the issue of search and rescue operations in Africa and examines in some detail where the world aviation community is right now and where it is headed in this important field of human endeavour.
Author
Africa; Rescue Operations; Civil Aviation; Air Transportation

20020076009 Argonne National Lab., IL USA
Simulation Studies and Information Pertaining to Star EndCap Strip SMD Primarily for Cosmic Ray Response
Underwood, D.; Jan. 08, 2002; In English; This document is color dependent and/or in landscape layout. It is currently only available on CD-ROM
Report No.(s): DE2002-41898; ANL-HEP-TR-02-12; No Copyright; Avail: National Technical Information Service (NTIS)

There are a number of issues in the use of the Argonne cosmic ray test stand to do quality control and calibration of the STAR EndCap Shower Max Detectors. The shower max detector is made up of 12 sectors of 30 degrees. Each sector has two planes of triangular scintillator strips. The strips in a plane are assembled with alternating direction of the triangles in order to use energy sharing for position measurement. The strips are 1 cm wide, 7 mm high, and range in length from a few cm to over a meter. There

are currently two analyses being done on the cosmic ray data, one using the average pulse height from all tracks, and one using the method of adjacent vetos to localize the cosmics. This study is also relevant to physics analysis utilizing energy sharing between triangular strips, although no EM shower simulations were done here.
NTIS
Cosmic Rays; Detectors; Simulation

Subject Term Index

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